Advanced Placement
E C O N O M I C S

Microeconomics: Student Activities
3rd edition

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Microeconomics | Contents

Microeconomics | Contents

Unit 5 The Role of Government

■ Scarcity exists because we have limited resources and unlimited wants. No society has ever had enough resources to produce all the goods and services its members wanted.

■ Goods and services are produced from productive resources. These resources — land, labor, capital and entrepreneurship — are limited.

■ Scarcity requires people to make choices. If we use scarce resources for one purpose, we cannot use them for another.

■ Opportunity cost is the forgone benefit of the next best alternative when resources are used for one purpose rather than another.

■ Because of scarcity, every decision has an opportunity cost.

■ Economic costs take account of the opportunity cost of doing one thing rather than another.

■ Economic costs include explicit costs, which are paid directly, and implicit costs, which are not paid directly. Both implicit and explicit costs are opportunity costs.

■ Using free goods does not involve opportunity cost because free goods are available in unlimited quantities.

■ Economics is concerned with marginal decision making. In economics, "making decisions at the margin" is very important. Marginal choices involve the effects of additions and subtractions from the current situation.

■ A production possibilities curve can be used to illustrate scarcity, choices and opportunity cost diagrammatically.

■ The slope of a production possibilities curve shows the opportunity cost of producing another unit of one good in terms of the amount of the other good that must be given up in order to produce the additional amount of the first good.

■ Because resources are scarce, using them efficiently allows us to get the most from them. Efficiency is increased through specialization and trade. Economists use the concepts of absolute advantage and comparative advantage to explain why trade takes place between countries and between individuals. These concepts are based on the differences in the opportunity costs of producing goods and services in different areas or by different individuals.

■ Because of scarcity, people and societies use economic systems to determine what to produce, how to produce and for whom to produce.

■ Throughout history, nations have used tradition, command and market systems to allocate resources.

■ The law of comparative advantage shows how everyone can gain through trade.

■ Economic theory is useful in analyzing and understanding the world around us.

■ The test of an economic theory is its ability to predict correctly the future consequences of economic actions.

■ The broad social goals of a society influence decisions about how best to use resources.

■ A diagram of the circular flow of resources, goods and services, and money-income payments is a simplified way of illustrating how a market economy operates. Prices in the product market and prices in the factor, or resource, market are determined by the interaction of supply and demand. This diagram is also called the circular flow of income.

Do You Think Like an Economist?

Circle T for *true* or F for *false* in the statements that follow.

T   F   1. Because it is desirable, sunshine is scarce.

T   F   2. Because it is limited, polio is scarce.

T   F   3. Because water covers three-fourths of the earth's surface and is renewable, it cannot be considered scarce.

T   F   4. The main cost of going to college is tuition, room and board.

T   F   5. If mass transportation fares are raised, almost everyone will take the trains anyway.

T   F   6. You get what you pay for.

T   F   7. If someone makes an economic gain, someone else loses.

T   F   8. If one nation produces everything better than another nation, there is no economic reason for these two nations to trade.

T   F   9. A nonregulated monopoly tends to charge the highest possible price.

T   F   10. A business owner's decision to show more care for consumers is a decision to accept lower levels of profits.

Scarcity, Opportunity Cost and Production Possibilities Curves

Scarcity necessitates choice. Consuming or producing more of one thing means consuming or producing less of something else. The opportunity cost of using scarce resources for one thing instead of something else is often represented in graphical form as a *production possibilities curve.*

Part A

Use Figures 2.1 and 2.2 to answer these questions. Write the correct answer on the answer blanks, or underline the correct answer in parentheses.

✳ Figure 2.1
Production Possibilities Curve 1
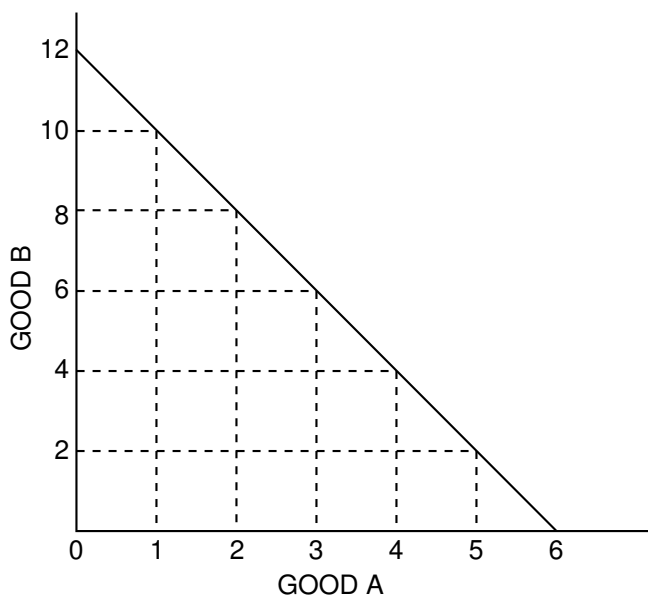
1. If the economy represented by Figure 2.1 is presently producing 12 units of Good B and zero units of Good A:

    (A) The opportunity cost of increasing production of Good A from zero units to one unit is the loss of _____ unit(s) of Good B.

    (B) The opportunity cost of increasing production of Good A from one unit to two units is the loss of _____ unit(s) of Good B.

    (C) The opportunity cost of increasing production of Good A from two units to three units is the loss of _____ unit(s) of Good B.

    (D) This is an example of *(constant / increasing / decreasing / zero)* opportunity cost per unit for Good A.

✳ Figure 2.2
Production Possibilities Curve 2
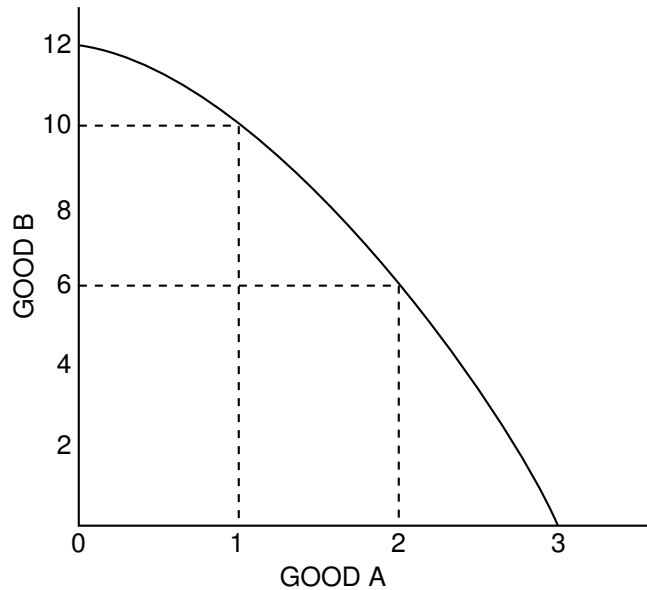
2. If the economy represented in Figure 2.2 is presently producing 12 units of Good B and zero units of Good A:

   (A) The opportunity cost of increasing production of Good A from zero units to one unit is the loss of _____ unit(s) of Good B.

   (B) The opportunity cost of increasing production of Good A from one unit to two units is the loss of _____ unit(s) of Good B.

   (C) The opportunity cost of increasing production of Good A from two units to three units is the loss of _____ unit(s) of Good B.

   (D) This is an example of (*constant / increasing / decreasing / zero*) opportunity cost per unit for Good A.

Part B

Use the axes in Figures 2.3, 2.4 and 2.5 to draw the type of curve that illustrates the label above each axis.

✳ Figure 2.3

Production Possibilities Curve 3
Increasing opportunity cost per unit of Good B

GOOD B

GOOD A
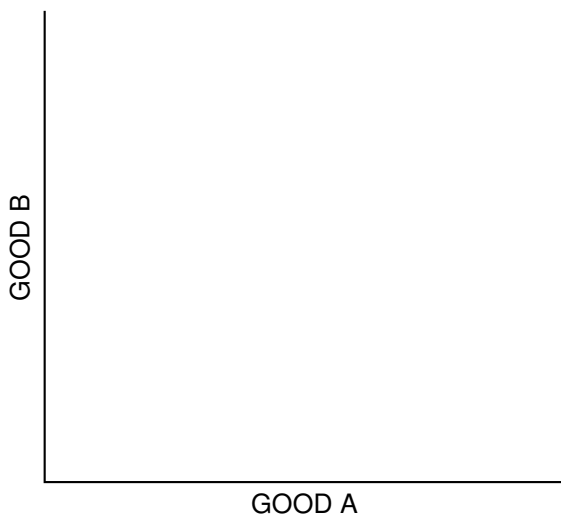
✳ Figure 2.4

Production Possibilities Curve 4
Zero opportunity cost per unit of Good B

GOOD B

GOOD A
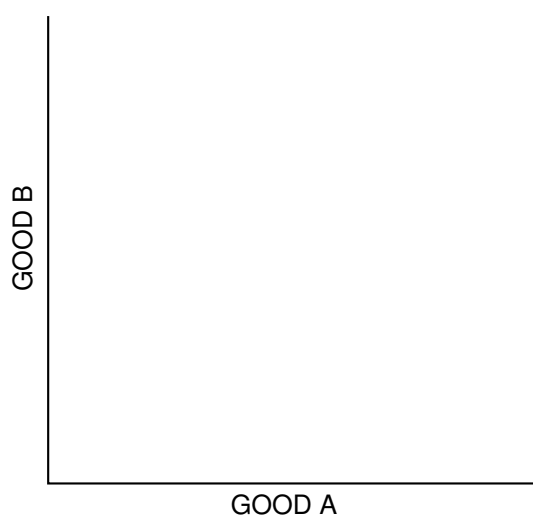
✳ Figure 2.5

Production Possibilities Curve 5

Constant opportunity cost per unit of Good B

GOOD B

GOOD A
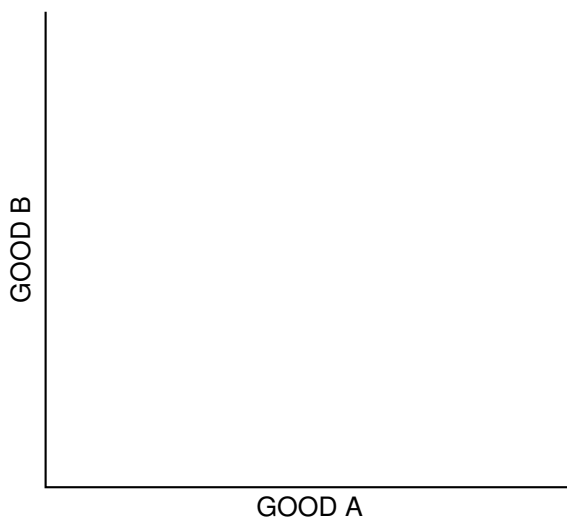
Part C

Use Figure 2.6 to answer the next five questions. Each question starts with Curve BB' as a country's production possibilities curve.

✳ Figure 2.6

Production Possibilities Curve: Capital Goods and Consumer Goods
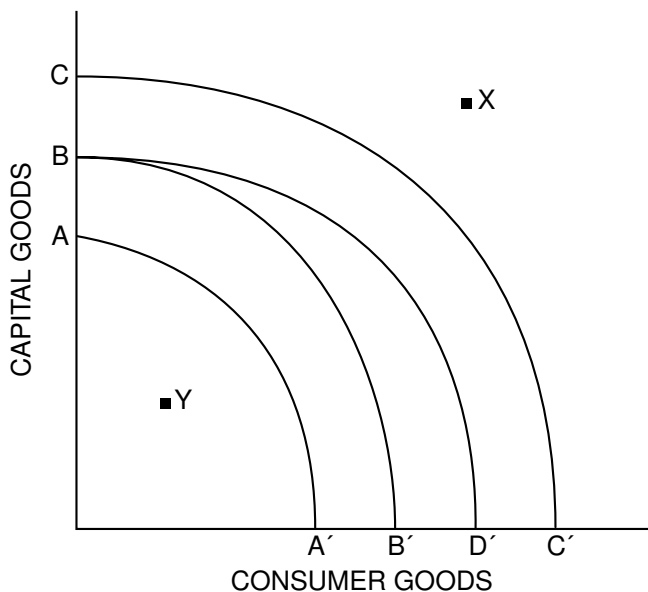
3. Suppose there is a major technological breakthrough in the consumer-goods industry, and the new technology is widely adopted. Which curve in the diagram would represent the new production possibilities curve? (Indicate the curve you choose with two letters.) _____

4. Suppose a new government comes into power and forbids the use of automated machinery and modern production techniques in all industries. Which curve in the diagram would represent the new production possibilities curve? (Indicate the curve you choose with two letters.) _____

5. Suppose massive new sources of oil and coal are found within the economy, and there are major technological innovations in both industries. Which curve in the diagram would represent the new production possibilities curve? (Indicate the curve you choose with two letters.) _____

6. If BB' represents a country's current production possibilities curve, what can you say about a point like X? (Write a brief statement.)

7. If BB' represents a country's current production possibilities curve, what can you say about a point like Y? (Write a brief statement.)

Part D

Use Figure 2.7 to answer the next three questions.

✳ Figure 2.7

Production Possibilities Curve: Capital Goods and Consumer Goods
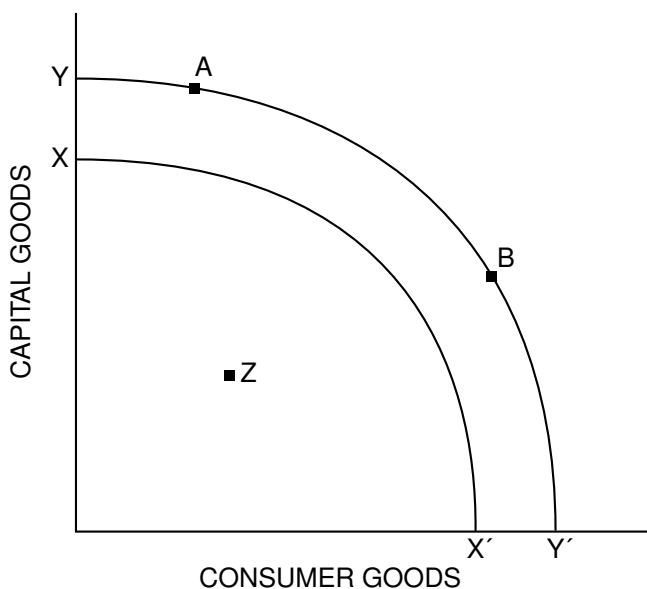
8. What change could cause the production possibilities curve to shift from the original curve (XX')
    to the new curve (YY')?

9. Under what conditions might an economy be operating at Point Z?

10. Why might a government implement policy to move the economy from Point B to Point A?

You Don't Have to Spend a Buck to Have a Cost

Last Friday night you decided to stay home and watch television instead of going to the movies with your friends. Did this decision involve any cost? Yes, because even though you didn't spend a buck, there was an *opportunity cost,* which represents the best alternative that you did not choose, such as working or participating in another activity.

Whenever consumers, producers and governments make choices, they base their decisions on the costs involved. In economics, costs include not only the out-of-pocket expenses you'd typically consider, called *explicit* costs, but also *implicit* costs, which measure the value of resources that could have been used elsewhere.

For instance, if you decide to go to the movies, your explicit costs may include the ticket, popcorn and soda. Additionally, you would include the implicit costs, such as the pay you would have earned had you worked during the time required to go to the movies. Economists refer to these combined costs as opportunity costs.

When you base decisions on explicit costs only, you can measure the number of dollars coming into your wallet versus the number flowing out. But rational people consider more than invoices and receipts when they compare marginal benefits with marginal costs. Extra benefits and extra costs include implicit costs, so making decisions by merely considering the flow of funds into and out of your wallet will lead to decisions that fail to maximize your satisfaction.

1. For each of the following situations, list at least two explicit costs and two implicit costs. Place them in the correct column.

	Explicit	Implicit
(A) You decide to go to college.	_____	_____
	_____	_____
	_____	_____
(B) You take a job after school.	_____	_____
	_____	_____
	_____	_____
(C) You study for and take an AP Economics Examination.	_____	_____
	_____	_____
	_____	_____
(D) A stay-at-home dad returns to work.	_____	_____
	_____	_____
	_____	_____

	Explicit	Implicit
(E) Family members work in their parents' restaurant.		
Child's (employee) viewpoint	_____	_____
	_____	_____
	_____	_____
Parents' (employer) viewpoint	_____	_____
	_____	_____
	_____	_____
	_____	_____

2. Pick one of the situations in Question 1, and explain why the decision maker must have decided that the benefits he or she received exceeded, equaled or fell short of the opportunity costs to engage in the activity.

Campus Parking

Good parking spaces on the Stanford University campus (as on most campuses) are at a premium, especially on rainy days. Stanford has about 11,000 students — of whom about half live on campus — about 1,000 faculty and perhaps 8,000 nonteaching staff members and other such employees. Sampling suggests that perhaps 8,000 to 15,000 drivers may seek parking on a rainy day.

Although there is no simple way to indicate the number of desirable parking spaces available (desirability depends on where one wishes to go on the campus), perhaps 1,500 to 2,000 spaces are very convenient to different parts of the central campus. Including all outlying areas of the campus (perhaps three to five blocks from classrooms and offices), a large number of additional parking spaces are available.

For many years, by tradition the best parking spaces were exclusively set aside for faculty members (via free "A" parking stickers) and the next most desirable ones for staff members (via free "B" stickers). Other reasonably close-in spaces were allocated to students at a small charge ("C" stickers). Distant campus parking was free to all. Some special parking was provided for physically disabled persons.

Not surprisingly, students frequently complained, as indeed did faculty and staff from time to time, since on rainy days there was an excess demand for all three reserved-parking areas. In this setting, the president's office announced that the parking situation was being reassessed and invited all concerned to submit their views. Five major approaches developed:

1. **Leave things as they have been.** This was quite popular with the faculty, who all got "A" stickers. Faculty were seldom made late to class by a shortage of good parking, and most staff and students could manage pretty well if they allowed a little extra time for getting where they were going. But you can guess what the antiestablishment students said.

2. **First-come, first-served.** This would let students, faculty and staff alike compete for the best parking places, which would presumably go to those who felt the greatest need for them. Your willingness to set the alarm ahead 10 minutes to get a reasonable parking space would be the best measure of how important the better place was to you. Who could make a better decision for you — and Stanford?

   Advocates of this plan emphasized its equity in treatment of the various groups on campus. Everyone has the same chance at the parking spaces (faculty and students, rich and poor, sleepers and early risers), and all would have an equal chance to get there first — or would they?

3. **Markets and a price system.** A third alternative would allocate the spaces by selling them. Put a rent on each space, and let the person who is willing to pay the most for it rent it

each semester or year. It would probably be convenient to group all the spaces into three or four classes: "A" spaces and stickers for the best locations, "B" for the next best and "C" for the least attractive. A price would be set for each sticker area that would roughly equate the number of stickers bought with the number of spaces available in that class. Thus, those who would pay the most would get the "A" spaces, the most desirable areas, at a higher price. Those who paid less would get the "B" stickers. Those who paid still less would get "C" stickers, and those unwilling to pay at all would use the outlying areas. There would be a liberal sprinkling of metered areas on campus for those who wanted to buy short-term parking.

Advocates of this plan argued that it would basically give the best parking spaces to those who were willing to pay for them, which is the way we allocate almost everything else in our society, and would in essence let the students and faculty themselves determine who got the best spaces. (In this plan, as in the others, special allowances would be made for handicapped students who needed special parking assistance; there was little dispute over this point.) Faculty members, staff and students would all have the same chance to get good parking. There would be no discrimination in price within each of the three groups.

4. **Democracy.** A fourth group argued that none of these approaches was obviously superior to the present system; and that in accordance with democracy, students, faculty and staff should all together elect a special parking committee to say who should get these places each year and how. There was some dispute over how this committee should be elected and what representation should be given to each of the various parking-demand groups on campus. Support for this alternative apparently depended in considerable part on the decision about how the representatives should be chosen.

5. **Random choice.** A few hearty souls, especially those from the statistics department, proposed an allocation of parking spaces through a random process. Tickets for the various classes of parking around the campus would be given out on a basis of random choice. That is, random numbers would be put in a bowl, with one number assigned to each person (faculty, students and staff) who wanted to be in on the drawing. Then the stickers would be allocated on the basis of the numbers drawn out of the bowl in a random fashion. Many observers said this was a wasteful way of doing it since it would obviously not take advantage of the preferences of different students and faculty members for different classes of lots. A few sophisticated souls suggested that this random process be used, and then let develop on campus a market for the tickets allocated through the random process. In this market, presumably the various stickers would be bid up in price until the people who wanted them the most had obtained them by paying a higher price for them than would be paid by parkers who wanted them less strongly. Many participants argued that this would be very unfair to those who needed parking space and had to pay for the space to those who won the best places in the drawing, even though some of the latter didn't even have cars.

How should Stanford allocate its limited supply of desirable parking spaces? In addition to the questions already raised above in the general discussion of the problem, you may want to consider the following questions:

(A) Is your main goal to maximize equity (fairness) or to obtain the most efficient allocation of resources (parking spaces)?

(B) Should people who live on or near the campus have the same chance of getting good parking spaces as people who live a considerable distance away?

(C) Does democracy or the price system give a more-efficient allocation of resources here? A more-equitable allocation of resources?

(D) Is this problem significantly different from the allocation of other scarce goods in our society — for example, the supply of apartments near the campus for those who live off campus? Hamburgers? Porsche autos? High-grade doctors to provide medical services when needed?

If you choose alternative (A) above, what criterion should the administration use if it is going to charge different amounts for stickers on different parts of the campus? Should Stanford, as a substantial monopolist, maximize its profit by charging the highest price it can get so as to obtain the most funds possible from the plan?

Campus Parking Activity

1. What central problem does Stanford face in parking spaces?

2. What are the three ways societies deal with scarcity?

3. Categorize the five methods Stanford could use to allocate parking spaces. Which use tradition? Command? The market?

4. For each proposed method, explain what behaviors are encouraged or discouraged by different groups.

5. If the goal is equity, which system would you adopt and why?

6. If the goal is efficiency, which system would you adopt and why?

7. Which system of allocating parking spaces do you recommend? Why?

The Circular Flow of Resources, Goods, Services and Money Payments

One way of illustrating the overall operation of a market economy is through a *circular flow diagram* such as the one on this page. This diagram presents a highly simplified overview of how a market economy operates.

Owners of resources (families and individuals) supply the services of their land, labor and capital to business firms in exchange for money-income payments in the form of wages and salaries, rents, interest and profits. Owners of the resources in turn use these income payments to purchase the finished goods and services supplied by the business firms. Business firms then use the proceeds from these sales to pay the resource owners for the services the firms receive by employing the resources. This is how the circular flow of resources, goods and services, and money-income payments is established and maintained.

Payments in the lower part of the diagram, which is sometimes called the *factor market*, appear as income to the resource owners who sell productive services. But these same payments appear as costs to the business firms that buy productive services.

Likewise, payments in the upper part of the diagram, which represents the *product market*, appear as costs to the resource owners who buy goods and services, but these same payments appear as income to the business firms that sell goods and services.

An important point to emphasize is that all of the money payments shown in the diagram are determined by an interdependent set of markets. In a system of interdependent markets, every price depends to some extent on every other price. For example, the prices resource owners are willing to pay for finished goods and services depend on the prices (income) they receive for the use of their resources. The prices of resources, in turn, depend on how much business firms are willing to pay for the services the resources provide. The diagram shows that everyone's expenditure is someone else's income and that the interaction between the markets determines these flows.

✳ Figure 5.1
The Circular Flow of Resources, Goods, Services and Money Payments
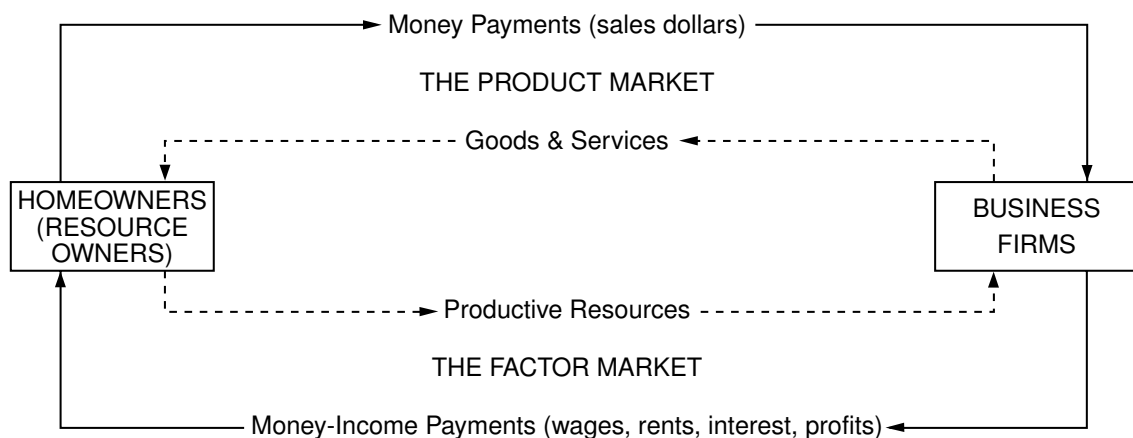
Circular Flow Activity

1. Give three examples of resource owners.

2. Define a business firm.

3. What is the product market?

4. Give three examples of transactions you made this week in the product market.

5. What is a factor market?

6. Give an example of a transaction you or your family made this month in a factor market.

7. How are businesses connected to factor and product markets?

8. What determines the prices of land, labor, capital and entrepreneurship in a factor market?

9. Where do resource owners get the money to buy goods and services in the product market?

10. Where do business firms get the money to pay resource owners for their land, labor, capital and entrepreneurship in factor markets?

11. Why is it important to know that a market economy is characterized by interdependence?

Opportunity Cost and Comparative Advantage

People who don't know much about economics often dismiss economics as being little more than cost / benefit analysis. While it is true that this is a very important concept, economics is not that simple. In fact, one of the most difficult things in economics is understanding the opportunity cost of choosing a particular action.

We have seen that economic entities such as countries often face *increasing* opportunity costs as they try to increase production. For instance, when a country finds itself at war and needs to increase its production of armaments, at first it finds that increasing military production comes at a relatively low opportunity cost, as the first factories converted to military use are generally well-suited for such an event.

As the war goes on, however, we see factories that are not at all well-suited to producing weapons being converted to military service, at a very high opportunity cost. Little is added to the output of armaments, and a great deal is sacrificed in terms of consumer goods.

The notion of increasing opportunity costs is manifested in a production possibilities curve that is concave towards the origin. In Figure 6.1, we can see that as we increase the production of military goods, each additional unit of output costs more in terms of civilian goods. When the government initially

✳ Figure 6.1
Production Possibilities Curve: Military and Civilian Goods
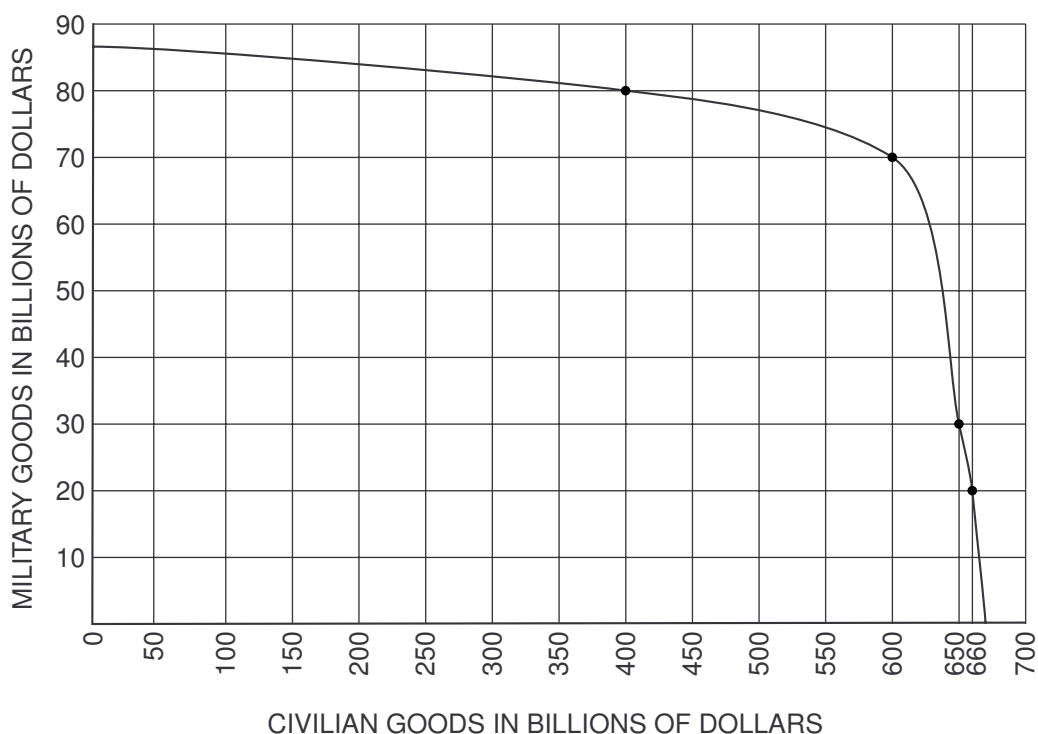
increases the output of military goods from $20 billion to $30 billion, the opportunity cost (in terms of civilian goods forgone) is small: only $10 billion of military goods ($660 billion minus $650 billion).

However, when the country is already producing a lot of military goods and wants to produce even more, the cost is much higher. If the country is producing $70 billion and wants to produce $80 billion, the opportunity cost is now $200 billion, or $600 billion minus $400 billion.

Opportunity cost also explains the incredible amount of trade that goes on among individuals, firms and countries. Today, of course, few of us produce our own goods and services; we rely on others to do this while we use our time earning money at a job. Instead of making our goods, we buy them. Computer manufacturers actually produce few of their own parts, but instead buy parts from suppliers.

Countries tend to specialize in the production of goods and services as well; for instance, there aren't any firms in the United States currently making television sets, and we make very few consumer electronics of any sort. Instead, our businesses concentrate on making other goods and services, and we import the televisions we need.

As we will see, we benefit from trade with other countries even if we are better at producing *everything* than the other country. Trade will benefit both countries as long as we each specialize in doing the task for which we have a lower opportunity cost. This is called *comparative advantage*.

Part A: Examples

Let's begin with a simple example. One summer two friends, Ty and Jessica, each started a business, making money by providing lawn-care services. Although they earned decent money working alone, they wondered if they could make more money by working together. The table below shows how many minutes it takes for each to complete the two tasks involved in doing one lawn: mowing and trimming, which includes the sweeping, edging and cleanup.

	Mow	Trim
Ty	60 minutes	40 minutes
Jessica	75 minutes	90 minutes

Someone who can do an activity using fewer resources is said to have an *absolute advantage*. Ty has an absolute advantage at both activities. Does this mean he should continue working alone?

If your instinct is to say that Ty should not partner with Jessica, you are wrong, but you are in good company: Adam Smith, whom many regard as the founder of modern economics, thought the same thing. It wasn't until David Ricardo came along in the early 1800s that people realized specialization and trade *can* benefit everyone *even if one of the parties has an absolute advantage at both activities!*

If Ty and Jessica are going to specialize, who should do what? Now, absolute advantage does not tell us anything, since Ty is better at both things. Instead, we have to look at *comparative advantage*.

We say someone has a comparative advantage at a task if this person can do the task at a *lower opportunity cost* than the other person.

Here, the opportunity cost of Ty mowing a lawn is how much of a lawn he could have trimmed in the same time. In this case, Ty could have used the 60 minutes it takes him to mow one lawn and he could have trimmed $1^1/_2$ lawns, or $^3/_2$ lawns.

For Jessica, the opportunity cost of mowing one lawn is what she could have trimmed during the 75 minutes she needed to mow that lawn. Jessica could have trimmed only $5/6$ (or $75/90$) of a lawn. Thus, we can see that Jessica has a comparative advantage in mowing lawns because Jessica's opportunity cost of mowing a lawn is lower than Ty's. Five-sixths of a lawn trimmed is less than $3/2$ lawns trimmed.

Now, we can calculate their opportunity cost to *trim* lawns. It takes Ty 40 minutes to trim one lawn, and with these 40 minutes he could instead have mowed $2/3$ of a lawn (or $40/60$). For Jessica, instead of using 90 minutes to trim one lawn, she could have spent these 90 minutes mowing one lawn and $1/5$ of another lawn ($90/75$). Thus, Ty has a comparative advantage in trimming lawns. The table below shows the relative opportunity costs.

	Opportunity cost of mowing one lawn	Opportunity cost of trimming one lawn
Ty	$3/2$ lawn trimmed	$2/3$ lawn mowed
Jessica	$5/6$ lawn trimmed	$6/5$ lawn mowed

Notice two things about our calculation of opportunity cost: First, Ty's opportunity cost of mowing one lawn ($3/2$ lawns trimmed) is the reciprocal of his opportunity cost of trimming one lawn ($2/3$). This will always be true, so in this example we did twice as much math as we would normally have to.

Second, notice that each person has a comparative advantage in precisely one activity. Unless a person is equally able at both activities, this will always be true as well.

Next, let's see whether this specialization actually increases their productivity. Before specializing, it would take Jessica 165 minutes (90 + 75) to mow and trim one lawn and Ty 100 minutes (60 + 40) to mow and trim one lawn, for a total of 265 minutes. If Jessica mows two lawns and Ty trims two lawns, then the total time needed to do two lawns would be 150 (75 x 2) + 80 (40 x 2) minutes or 230 minutes.

Thus, they save 35 minutes, or 13 percent of the total time necessary to do the lawns without specializing. Together, they can do more lawns in a week, and they can split the additional income so both are richer.

Let's look at one more example. Here, we will express the relative productivity of each person not in the number of minutes they need to do the activity but instead in *how many activities they can do in an hour.*

A few years ago Mark and Doreen were earning extra money installing car stereos for a local electronics store when they decided to go into business for themselves. After they rented a garage, they had to decide who should do what activity. The table below describes their productivity in the number of stereos and speakers installed per hour.

	Mark	Doreen
Radios installed	6	10
Speakers installed	2	5

The table below contains the breakdown of the opportunity cost for each person to do each activity.

	Mark	Doreen
Installing 1 radio	$1/3$ speaker	$1/2$ speaker
Installing 1 speaker	3 radios	2 radios

Mark has the comparative advantage in installing radios, and Doreen has the comparative advantage in installing speakers. By specializing, their total output increases.

Part B: Questions

1. What is the difference between comparative advantage and absolute advantage?

2. You're given the following information about a newlywed couple and the time it takes each of them to do two different chores: vacuuming a room or washing a load of dishes.

	Mike	Debbie
Vacuum a room	60 minutes	45 minutes
Wash a load of dishes	30 minutes	45 minutes

(A) What is Mike's opportunity cost of vacuuming in terms of washing dishes?

(B) What is Mike's opportunity cost of washing dishes in terms of vacuuming?

(C) What is Debbie's opportunity cost of vacuuming in terms of washing dishes?

(D) What is Debbie's opportunity cost of washing dishes in terms of vacuuming?

(E) Who has the *absolute* advantage in vacuuming? _____

(F) Who has the *absolute* advantage in washing dishes? _____

(G) Who has the *comparative* advantage in vacuuming? _____

(H) Who has the *comparative* advantage in washing dishes? _____

(I) Who should do which chore and why? Base your answer only on the information above and on comparative-advantage considerations.

3. Now, you're given the following information about Andy and Hannah and the time it takes each of them to clean an office and clean a jail cell:

	Andy	Hannah
Cleaning offices	60 minutes	20 minutes
Cleaning jail cells	30 minutes	15 minutes

(A) What is Andy's opportunity cost of cleaning offices in terms of cleaning jail cells?

(B) What is Hannah's opportunity cost of cleaning offices in terms of cleaning jail cells?

(C) What is Andy's opportunity cost of cleaning jail cells in terms of cleaning offices?

(D) What is Hannah's opportunity cost of cleaning jail cells in terms of cleaning offices?

(E) Who has the *absolute* advantage in cleaning offices? _____

(F) Who has the *absolute* advantage in cleaning jail cells? _____

(G) Who has the *comparative* advantage in cleaning offices? _____

(H) Who has the *comparative* advantage in cleaning jail cells? _____

(I) Who should do which chore and why? Base your answer only on the information above and on comparative-advantage considerations.

4. Consider the following two countries. Assume they produce only these two goods. *Note that productivity is now measured in how many goods can be produced per hour*, the opposite of how we measured it in Questions 2 and 3.

	United States	Japan
Cars	12	10
Computers	4	6

(A) What is the United States' opportunity cost of making cars?

(B) What is Japan's opportunity cost of making cars?

(C) What is the United States' opportunity cost of making computers?

(D) What is Japan's opportunity cost of making computers?

(E) Which country has the *absolute* advantage in cars? _____

(F) Which country has the *absolute* advantage in computers? _____

(G) Which country has the *comparative* advantage in cars? _____

(H) Which country has the *comparative* advantage in computers? _____

(I) Which country should produce which good and why? Base your answer only on the information above and on comparative-advantage considerations.

5. Use the law of comparative advantage to explain why self-sufficiency leads to a lower standard of living.

Is the Benefit of Doing Anything Worth the Cost of Doing It Well?

Bartlett's Familiar Quotations contains wisdom from writers separated by a millennium and a half. Whose wisdom best fits today's world?

> *Always take the short cut; and that is the rational one. Therefore say and do everything according to soundest reason.*

Meditations iv.51
Marcus Aurelius
A.D. 120 to 181

> *Whatever is worth doing at all is worth doing well.*

Philip Dormer Stanhope
Earl of Chesterfield
1694 to 1773

Between these two extremes, one discovers the economic way of thinking. We know that productive resources are limited, so we cannot have everything we want. We must economize by choosing among alternatives. We may want the very best product available, but we settle on a product with fewer features or less durability because the extra benefit of the product we would most like to have is simply not worth the extra cost. Resources that aren't devoted to making a good product perfect can be allocated to making other products.

Few choices we make in life are all-or-nothing decisions. We decide on the number of assigned chapters to read today based on alternative uses of our time. We frequently adjust the number of hours we study for each subject because of tests and nonschool uses of our day. Epidemic doses of "senioritis" — severely curtailing work for grades after college-acceptance letters are received — may suggest that the majority of students agree with Marcus Aurelius rather than the Earl of Chesterfield. Even the most severe victims of senioritis may admit that they are incurring a very different cost: the lost opportunities to learn the cultural and scientific knowledge that will be required in college.

An excellent academic record in high school expands the array of college choices for the graduating high school senior. "A" grades are preferred to "C" grades for reasons that don't warrant an explanation: The extra benefits of the explanation are not worth the extra costs of reading it.

This comparison of additional, or marginal, benefits and costs applies to production decisions, too. Of course, auto companies can make cars that work for a quarter century, but would the extra manufacturing cost be worthwhile over the product lifetime? Technical advances frequently lead to superior products at lower cost. Because of blindingly rapid changes in computer technology, the concept of an "old" computer is measured in months; so building a computer case that lasts for 50 years would be wasteful. Can you suggest services or products that are satisfactory, but not superior?

Thinking about the future requires that we acknowledge what we have and then make incremental changes so the marginal benefits of the changes exceed the marginal costs. Mechanical equipment in an aircraft must meet higher quality standards than the same product in a car. If the alternator fails in a car, one typically has enough time to pull off the road before the car stops. In an airplane, safe-landing options are fewer than those available to the motorist. Both quality decisions are correct because the added benefits from avoiding failure in a plane greatly exceed the marginal benefits from avoiding mechanical failure in a car.

Activity written by W.C. Kerby, Center for Economic Education, California State University, Sacramento, Calif.

1. After reading in *Bartlett's Familiar Quotations* that "knowledge is power," a student decides to be as knowledgeable as possible by devoting the next 20 years, without interruption, to college. From the data below, how would you advise this person to reconsider a career as a professional student? (Write the correct answer in the space, or underline the correct word in parentheses.)

✳ Figure 7.1
Degree Earned and Expected Lifetime Earnings

Degree Earned	Expected Lifetime Earnings by Degree	Expected Lifetime Costs by Degree
High School	$ 800,000	$ 0
Associate	1,200,000	25,000
Bachelor's	2,000,000	100,000
Master's	2,100,000	200,000
Doctorate	2,500,000	2,500,000

(A) Would a master's degree and a doctorate degree be likely to build the human capital of the student? (*Yes / No*)

In the process of building knowledge, would the doctorate degree be the best example of doing a job well? (*Yes / No*)

(B) Assuming that inflation and interest rates are considered in these data, what is the optimal degree for this person to earn at the university?

(C) Which criterion did you use to determine the optimal degree this person should obtain? (*Total / Marginal*) benefits = (*total / marginal*) costs

(D) Since inflation is already factored into the data, what is the most likely reason that the costs of a doctorate degree rose to such a high level?

2. Wrapping garbage neatly before taking it to the trash can, raking leaves on a windy day, hand-drying dishes after they have been run through a dishwasher's dry cycle and similar tasks seem to push the credibility of any value in doing a job well.

(A) Give examples of job requests you have heard that illustrate severely declining marginal benefits.

(B) Give estimates of the opportunity cost of accomplishing these tasks.

3. Consider a group of small or large electronic items that you have thought about buying. Do you always choose the highest-priced goods? Explain your answer.

4. If you wanted to eliminate "senioritis," how would you change the college-acceptance process and/or the incentives offered by high school instructors?

Thinking in an Economic Way

Economics is a way of thinking that views people as rational decision makers who seek to maximize their own welfare within their personal interests and values. Even though people have different values, we all want to maximize benefits and minimize costs. Some people want fast cars and yachts; some want big houses and a good life for their families and others value education. Because of costs, people cannot get everything they want.

   As you answer these problems, you must be sure to evaluate costs and benefits. And never forget the concept of scarcity.

1. True, false or uncertain, and explain why? "The best things in life are free."

2. Is life priceless? Give at least four examples to support your opinion. Use the concept of opportunity cost in your answer.

3. Teachers are usually displeased when students cheat on tests. Which of these methods intended to stop cheating would be most effective? Why?

    (A) Teachers should say nothing and trust the students to be fair. If people are treated responsibly, they will act responsibly.

    (B) Teachers should give lectures on morality and explain to the students how their actions are not only dishonest but may hurt their classmates.

    (C) Teachers should walk around the room when giving tests, give the students alternate tests and make sure the students understand they will fail if they are caught cheating.

4. True, false or uncertain, and explain why? "The economic concept of scarcity is not relevant to a modern economy such as the United States. Americans are surrounded by vast quantities of unused goods. For example, food fills the supermarkets, and every car dealer has many cars in the showroom and lot. Americans are surrounded by plenty, not scarcity."

5. True, false or uncertain, and explain why? "Money is one of America's most important economic resources."

6. An economics professor got a new job in a new town. When she arrived in the new town, she wanted to rent an apartment. She pulled into the first gas station she saw, filled up her tank and drove around inspecting apartments. She rented the tenth apartment she inspected. Does her behavior make sense economically, or did she fail to practice what she preaches? Use marginal benefit and marginal cost analysis in your answer.

7. Tina is an outstanding lawyer. She also word processes faster than anyone else in her town. Tom word processes at half the speed of Tina. Tom is not a lawyer. Should Tina hire Tom? Why or why not? Use the concepts of absolute and comparative advantage in your answer.

Sample Multiple-Choice Questions

Circle the letter of each correct answer.

1. The crucial problem of economics is

   (A) establishing a fair tax system.

   (B) providing social goods and services.

   (C) developing a price mechanism that reflects the relative scarcities of products and resources.

   (D) allocating scarce productive resources to satisfy wants.

   (E) enacting a set of laws that protects resources from overuse.

2. When one decision is made, the next best alternative not selected is called

   (A) economic resource.

   (B) opportunity cost.

   (C) scarcity.

   (D) comparative disadvantage.

   (E) production.

3. Which of the following is true if the production possibilities curve is a curved line concave to the origin?

   (A) Resources are perfectly substitutable between the production of the two goods.

   (B) It is possible to produce more of both products.

   (C) Both products are equally capable of satisfying consumer wants.

   (D) The prices of the two products are the same.

   (E) As more of one good is produced, more and more of the other good must be given up.

4. Which of the following is true of the concept of increasing opportunity cost?

   (A) It is unimportant in command economies because of central planning.

   (B) It suggests that the use of resources to produce a set of goods and services means that as more of one is produced, some of the other must be sacrificed.

   (C) It is irrelevant if the production possibilities curve is convex to the origin.

   (D) It suggests that unlimited wants can be fulfilled.

   (E) It means that resources are plentiful and opportunities to produce greater amounts of goods and services are unlimited.

5. To be considered scarce, an economic resource must be which of the following?
   I.   Limited
   II. Free
   III. Desirable

   (A) I only

   (B) I and II only

   (C) II and III only

   (D) I and III only

   (E) I, II and III

6. The basic economic problem is reflected in which of the following concepts?
   I.   Opportunity cost
   II. Production possibilities
   III. The fallacy of composition
   IV. *Ceteris paribus*

   (A) I only

   (B) IV only

   (C) I and II only

   (D) II and III only

   (E) II, III and IV only

7. Which of the following goods would be considered scarce?
   I.   Education
   II. Gold
   III. Time

   (A) I only

   (B) II only

   (C) III only

   (D) I and II only

   (E) I, II and III

8. The value of the best alternative forgone when a decision is made defines

   (A) economic good.

   (B) opportunity cost.

   (C) scarcity.

   (D) trade-off.

   (E) comparative advantage.

9. Which of the following problems do all economic systems face?
   I.   How to allocate scarce resources among unlimited wants
   II. How to distribute income equally among all the citizens
   III. How to decentralize markets
   IV. How to decide what to produce, how to produce and for whom to produce

   (A) I only

   (B) I and IV only

   (C) II and III only

   (D) I, II and III only

   (E) I, II, III and IV

10. In which way does a straight-line production possibilities curve differ from a concave production possibilities curve?

    (A) A straight-line production possibilities curve has a decreasing opportunity cost.

    (B) A straight-line production possibilities curve has a constant opportunity cost.

    (C) A straight-line production possibilities curve has an increasing opportunity cost.

    (D) A straight-line production possibilities curve does not show opportunity cost.

    (E) There is no difference between the two production possibilities curves.

11. The law of increasing opportunity cost is reflected in the shape of the

    (A) production possibilities curve concave to the origin.

    (B) production possibilities curve convex to the origin.

    (C) horizontal production possibilities curve.

    (D) straight-line production possibilities curve.

    (E) upward-sloping production possibilities curve.

The figure below is used for questions 12 through 15. It shows the production possibilities curve for a country with full employment of a given-size labor force.
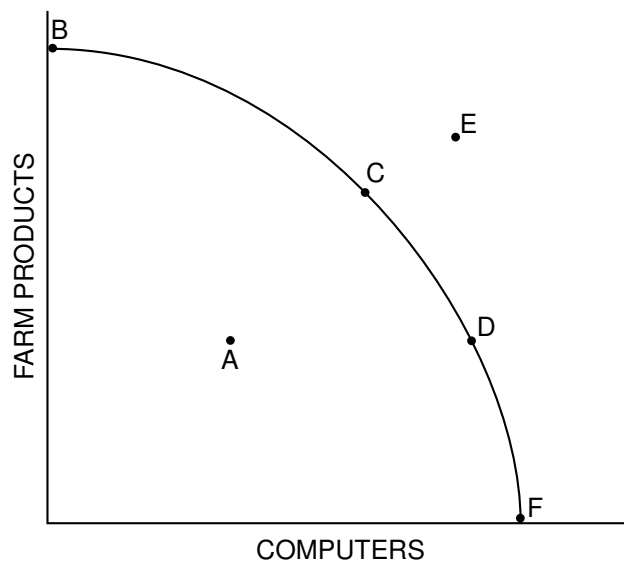
12. If the country is currently producing at Point C, it can produce more computers by doing which of the following?

    (A) Moving to Point A

    (B) Moving to Point B

    (C) Moving to Point D

    (D) Moving to Point E

    (E) Remaining at Point C, since computer production is maximized

13. Which of the following statements about the production possibilities curve is true?

    (A) Point A is not attainable in a developed society.

    (B) Point D is not attainable given the society's resources.

    (C) The relative position of Points C and D reflect production alternatives rather than relative prices.

    (D) Elimination of unemployment will move the production possibilities curve to the right, closer to Point E.

    (E) Point E lies outside the production possibilities curve because it represents a combination of resources not desired by the citizens of the country.

14. How might Point E be attained?

    (A) If the country's resources were more fully employed

    (B) If the country's resources were shifted to encourage more efficient use of scarce resources

    (C) If improvements in technology occurred in either the computer sector or the farm-products sector

    (D) If firms decreased their output of computers

    (E) If the nation used more of its scarce resources to produce farm products

15. The production possibilities curve of the country would be most likely to shift to the right if the country were currently producing at which of the following points?

    (A) Point A

    (B) Point B

    (C) Point C

    (D) Point D

    (E) Point E

The figure below is used for questions 16, 17 and 18. It shows the production possibilities curve for two types of goods for a country with full employment of a given-size labor force.
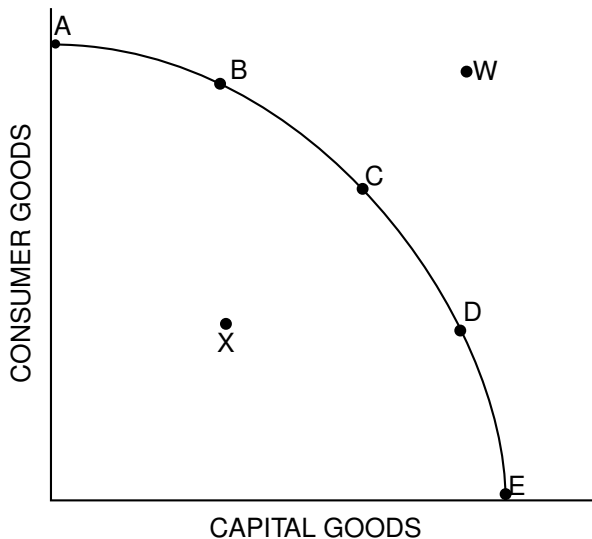
16. If the country is currently producing at Point C, it can produce more capital goods by moving in the direction of

   (A) Point A.

   (B) Point B.

   (C) Point D.

   (D) Point W.

   (E) Point X.

17. If the country moves from Point C to Point D, future economic growth will

   (A) decrease.

   (B) increase.

   (C) not change, but consumer satisfaction will increase.

   (D) not change, but unemployment will increase.

   (E) not change, but inflation will increase.

18. Which of the following is most likely to cause the production possibilities curve to shift outward toward Point W?

   (A) Employing the country's resources more fully

   (B) Shifting the country's resources to encourage more efficient use of scarce resources

   (C) Improving the technology for the production of either consumer or capital goods

   (D) Decreasing production of capital goods

   (E) Shifting some scarce resources to produce consumer goods in the current period

19. The opportunity cost of producing an additional unit of product A is

   (A) all of the human and capital resources used to produce product A.

   (B) the retail price paid for product A.

   (C) the wholesale price of product A.

   (D) the amount of product B that cannot now be produced because of product A.

   (E) the profit that was earned from producing product A.

20. Which of the following would cause a leftward shift of the production possibilities curve?

   (A) An increase in unemployment

   (B) An increase in inflation

   (C) An increase in capital equipment

   (D) A decrease in consumer demand

   (E) A decrease in working-age population

21. Which of the following would cause an outward or rightward shift in the production possibilities curve?

   (A) An increase in unemployment

   (B) An increase in inflation

   (C) An increase in capital equipment

   (D) A decrease in natural resources

   (E) A decrease in the number of workers

Use the following table for questions 22, 23 and 24.

Mars		Venus	
Food	Clothing	Food	Clothing
0	30	0	40
2	24	4	32
4	18	8*	24*
5*	12*	12	16
8	6	16	8
10	0	20	0

Two nations, Mars and Venus, each produce food and clothing. The table above gives points on each nation's production possibilities curve. The asterisks indicate their current point of production.

22. In Mars, the opportunity cost of obtaining the first two units of food is how many units of clothing?

(A) 2   (B) 3

(C) 6   (D) 8

(E) 12

23. In Venus, the opportunity cost of the first unit of

(A) food is two units of clothing.

(B) food is eight units of clothing.

(C) clothing is two units of food.

(D) clothing is four units of food.

(E) clothing is eight units of food.

24. Which of the following statements is correct based on the concept of comparative advantage?

(A) Mars and Venus should continue producing the quantities indicated by the asterisks.

(B) Mars should specialize in the production of food.

(C) Mars should specialize in the production of clothing.

(D) Venus has the comparative advantage in clothing.

(E) Mars has an absolute advantage in the production of food.

25. The table below shows the number of hours needed to produce one bushel of soybeans and one bushel of rice in each of two countries.

Country	One bushel of soybeans	One bushel of rice
U.S.	5 hours	7 hours
Japan	15 hours	10 hours

Which of the following statements must be true?

I. The United States has an absolute advantage in producing soybeans.

II. Japan has an absolute advantage in producing rice.

III. Japan has a comparative advantage in producing soybeans.

IV. The United States should specialize in the production of soybeans and Japan should specialize in the production of rice.

(A) I only

(B) III only

(C) I and IV only

(D) II and IV only

(E) I, II, III and IV

26. A rational decision maker will choose to act only if

(A) the marginal benefit of the action is greater than the average cost of that action.

(B) the marginal benefit of the action is greater than the marginal cost of that action.

(C) the marginal benefit of the action is less than the average cost of that action.

(D) the average benefit of the action is less than the average cost of that action.

(E) the average benefit of the action is greater than the average cost of that action, and the marginal benefit of the action is greater than the marginal cost of that action.

27. According to the theory of comparative advantage, a good should be produced where

    (A) its explicit costs are least.

    (B) its opportunity costs are least.

    (C) the cost of real resources used is least.

    (D) production can occur with the greatest increase in employment.

    (E) production can occur with the lowest increase in employment.

28. Which of the following statements violates the economic concept of matching marginal benefits with marginal costs in test taking?

    (A) "My grade in this course is already an A and the final examination is optional, so I'm not taking the final examination in this class."

    (B) "My grade going into the final examination for math is B-plus. The final exam constitutes half of the course grade, so I'm going to study more for the final in this class than in solid-state genetics, where I have a solid A."

    (C) "Most of my grades are B-minus, but in fluid dynamics I have an A. I'm going to study only for the final exam in fluid dynamics."

    (D) "If I spend two extra hours a week reading English literature, my scores on standardized tests of verbal skills will improve by 20 percent. Since my verbal skills are average, I'm going to reallocate my time into reading more literature."

    (E) All the statements violate the concept of matching marginal benefits with marginal costs in test taking.

29. "If you want to have anything done correctly, you have to do it yourself." This quote violates the principle of which of the following economic concepts?

    (A) Scarcity

    (B) Supply

    (C) Comparative advantage

    (D) Diminishing returns

    (E) Demand

30. After graduating with an accounting degree, you decide to become a rock star. Your opportunity costs include which of the following?

    I.   Goods forgone to build and furnish a home studio in which to practice and record

    II. Tuition costs

    III. Forgone income as an accountant

    (A) I only

    (B) II only

    (C) III only

    (D) I and II only

    (E) I and III only

Sample Short Free-Response Questions

Graph I
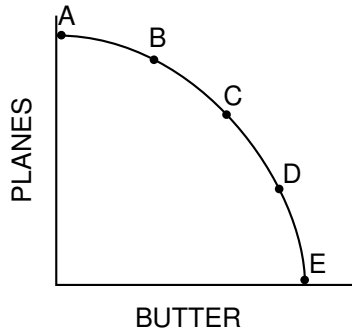
Graph II
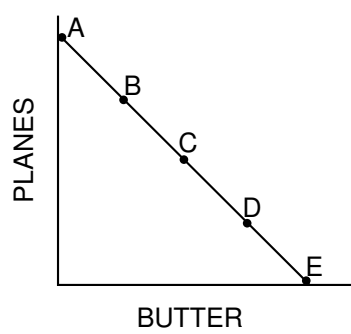
Graph III
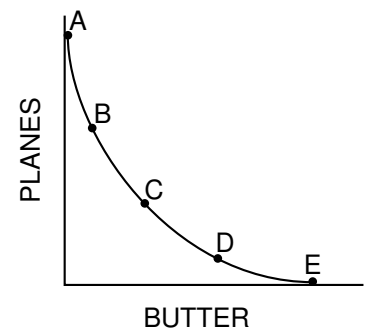
1. Explain what would have to be true in each case for the production possibilities curves to be shaped as they are in Graphs I, II and III.

2. True, false or uncertain, and explain why? "If you won $1 million in the lottery, you wouldn't have the economic problem of scarcity."

Sample Long Free-Response Questions

1. Every society has the fundamental problem of scarcity.

   (A) What is scarcity?

   (B) What three questions must every society answer because of scarcity?

   (C) What are the three ways societies have dealt with the scarcity problem?

   (D) Give one example of how each way is used in the United States.

2. Hightechland produces two commodities: movies and computers. Hightechland's resources include workers, factories, electricity and so on. The following schedule indicates some of the points on Hightechland's production possibilities curve.

Commodity	A	B	C	D	E
Movies	100	75	50	25	0
Computers	0	30	55	70	80

   (A) Does movie production exhibit increasing, decreasing or constant per-unit opportunity costs?

   (B) Graph Hightechland's production possibilities curve, and label it AA.

(C) Suppose Hightechland is operating at Point C but would like to alter production to Point D. What would be the per-unit opportunity cost of producing more computers?

(D) Suppose Hightechland is operating at Point C but would like to alter production to Point B. What would be the per-unit opportunity cost of producing more movies?

(E) What will happen to Hightechland's production possibilities curve if many of its movie sets are destroyed by fire? (Assume that the sets are not used in the production of computers.) Using the same graph you drew for Question 2(B), draw Hightechland's new production possibilities curve and label it BB.

(F) What will happen to Hightechland's production possibilities curve if all the country's resources are reduced (perhaps by natural disaster or war)? Using the same graph as in Question 2(B), draw Hightechland's new production possibilities curve and label it CC.

(G) What will happen to Hightechland's production possibilities curve if technology improves both the production of movies and the production of computers? Using the same graph as in Question 2(B), draw Hightechland's new production possibilities curve and label it DD.

3. Explain how each of the following may affect the production possibilities curve of the United States or the point at which the economy is operating. Draw a production possibilities curve; put "Capital Goods" on the vertical axis and "Consumer Goods" on the horizontal axis. Now, add a PPC curve or point to the graph to illustrate the scenario.

(A) The Congress and the president decide to provide more funding for higher education with more students attending college and graduating.

(B) New advances in medicine allow for a healthier lifestyle.

(C) The United States agrees to be a part of a world-trade agreement that will foster international trade.

(D) The unemployment rate increases in
the economy from 4.2 percent to 5.1
percent of the labor force.

(E) Computer viruses are out of control,
and efficiency and output in the
economy fall.

- Demand is the relationship between price and the amount that consumers are willing and able to purchase at various prices in a given period of time. The law of demand states that consumers buy more at lower prices and less at higher prices, all other things equal.

- There is a difference between a change in demand and a change in quantity demanded. A change in quantity demanded can be caused only by a change in the price of the good. It is a movement along the demand curve. At a lower price, a greater quantity is demanded.

- A change in demand means that more or less is demanded at every price; it is caused by changes in preferences, incomes, expectations, population and the prices of complementary or substitute goods.

- The income effect, the substitution effect and the law of diminishing marginal utility can explain why a demand curve is downward sloping.

- The law of diminishing marginal utility states that as more of a good or service is consumed in a given period of time, the additional benefit or satisfaction declines.

- Supply is the relationship between price and the amount that producers are willing and able to sell at various prices in a given period of time. Producers are willing to sell more at higher prices and less at lower prices, all other things equal.

- There is a difference between a change in supply and a change in quantity supplied. A change in quantity supplied can be caused only by a change in the price of a good. It is a movement along the curve. A change in supply is a shift of the curve where more or less is supplied at every price. Changes in technology, production costs, taxes, subsidies and expectations will cause a shift in supply.

- In competitive markets, supply and demand constitute the sum of many individual decisions to sell and to buy. The interaction of supply and demand determines the price and quantity that will clear the market. The price where quantity supplied and quantity demanded are equal is called the equilibrium or market-clearing price.

- At a price higher than equilibrium, there is a surplus and pressure on sellers to lower their prices. At a price lower than equilibrium, there is a shortage and pressure on buyers to offer higher prices.

- An administered maximum price is called a price ceiling. A price ceiling below the equilibrium price causes shortages. A price ceiling set at or above the equilibrium price has no effect on the market.

- An administered minimum price is called a price floor. A price floor above the equilibrium price causes surpluses. A price floor set at or below the equilibrium price has no effect on the market.

- Market prices promote economic progress because at the equilibrium price there is both consumer and producer surplus. In other words, buyers and sellers are both better off at the equilibrium price.

- Consumer surplus is the difference between what consumers are willing to pay for a good or service and the price that consumers actually have to pay.

- Producer surplus is the difference between the price businesses would be willing to accept for the goods and services and the price they actually receive.

- Price elasticity of demand refers to how much the quantity demanded changes in relation to a given change in price. If the percentage change in quantity demanded is greater than the percentage change in price, the demand for the good is considered elas-

tic. If the percentage change in quantity demanded is less than the percentage change in price, the demand for the good is considered inelastic. If the percentage change in price is equal to the percentage change in quantity demanded, the demand for the good is considered unit elastic.

■ Luxuries have a more-elastic demand than necessities because luxury goods use a greater percentage of income. High-priced goods have a more elastic demand than low-priced goods. Goods that are habit-forming tend to have an inelastic demand. Demand is more elastic in the long run than in the short run.

■ Price elasticity of demand can be determined by using the total revenue and arc methods.

■ Price elasticity of supply, also stated in percentage terms, refers to how much quantity supplied changes in relation to a given change in price. Supply is more elastic in the long run than in the short run.

■ In a market economy, prices provide information, allocate resources and act as rationing devices. It is important to know how to illustrate a wide range of situations with supply and demand graphs.

Demand Curves, Movements Along Demand Curves and Shifts in Demand Curves

Part A

Figure 9.1 shows the market demand for a hypothetical product: Greebes. Study the data, and plot the demand for Greebes on the axes in Figure 9.2. Label the demand curve D, and answer the questions that follow. Write the correct answer in the answer blanks or underline the correct words in parentheses.

✳ Figure 9.1
Demand for Greebes

Price ($ per Greebe)	Quantity Demanded (millions of Greebes)
$.10	350
.15	300
.20	250
.25	200
.30	150
.35	100
.40	50

✳ Figure 9.2
Demand for Greebes
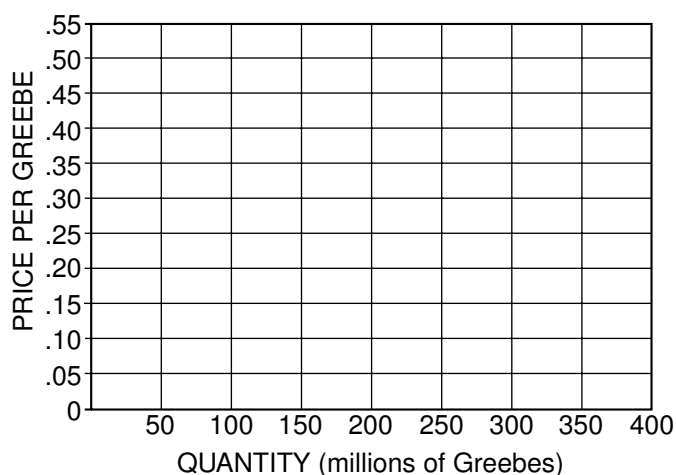
The data for demand curve D indicate that at a price of $0.30 per Greebe, buyers would be willing to buy _____ million Greebes. Other things constant, if the price of Greebes increased to $0.40 per Greebe, buyers would be willing to buy _____ million Greebes. Such a change would be a decrease in *(demand / quantity demanded)*. Other things constant, if the price of Greebes decreased to $0.20, buyers would be willing to buy _____ million Greebes. Such a change would be called an increase in *(demand / quantity demanded)*.

Now, let's suppose there is a dramatic change in federal income-tax rates that affects the disposable income of Greebe buyers. This change in the *ceteris paribus* (all else being equal) conditions underlying the original demand for Greebes will result in a new set of data, shown in Figure 9.3. Study these new data, and add the new demand curve for Greebes to the axes in Figure 9.2. Label the new demand curve D_1 and answer the questions that follow.

✳ Figure 9.3
New Demand for Greebes

Price ($ per Greebe)	Quantity Demanded (millions of Greebes)
$.05	300
.10	250
.15	200
.20	150
.25	100
.30	50

Comparing the new demand curve (D_1) with the original demand curve (D), we can say that the change in the demand for Greebes results in a shift of the demand curve to the *(left / right)*.

Such a shift indicates that at each of the possible prices shown, buyers are now willing to buy a *(smaller / larger)* quantity; and at each of the possible quantities shown, buyers are willing to offer a *(higher / lower)* maximum price. The cause of this demand curve shift was a(n) (*increase / decrease*) in tax rates that (*increased / decreased*) the disposable income of Greebe buyers.

Now, let's suppose that there is a dramatic change in people's tastes and preferences for Greebes. This change in the *ceteris paribus* conditions underlying the original demand for Greebes will result in a new set of data, shown in Figure 9.4. Study these new data, and add the new demand curve for Greebes to the axes in Figure 9.2. Label the new demand curve D_2 and answer the questions that follow.

✳ Figure 9.4
New Demand for Greebes

Price ($ per Greebe)	Quantity Demanded (millions of Greebes)
$.20	350
.25	300
.30	250
.35	200
.40	150
.45	100
.50	50

Comparing the new demand curve (D_2) with the original demand curve (D), we can say that the change in the demand for Greebes results in a shift of the demand curve to the *(left / right)*.

Such a shift indicates that at each of the possible prices shown, buyers are now willing to buy a *(smaller / larger)* quantity; and at each of the possible quantities shown, buyers are willing to offer a *(lower / higher)* maximum price. The cause of this shift in the demand curve was a(n) *(increase / decrease)* in people's tastes and preferences for Greebes.

Part B

Now, to test your understanding, underline the answer you think is the one best alternative in each of the following multiple-choice questions.

1. Other things constant, which of the following would *not* cause a change in the demand (shift in the demand curve) for mopeds?

    (A) A decrease in consumer incomes

    (B) A decrease in the price of mopeds

    (C) An increase in the price of bicycles

    (D) An increase in people's tastes and preferences for mopeds

2. "Rising oil prices have caused a sharp decrease in the demand for oil." Speaking precisely, and using terms as they are defined by economists, choose the statement that best describes this quotation.

    (A) The quotation is correct: An increase in price always causes a decrease in *demand*.

    (B) The quotation is incorrect: An increase in price always causes an increase in *demand*, not a decrease in *demand*.

    (C) The quotation is incorrect: An increase in price causes a decrease in the *quantity demanded*, not a decrease in *demand*.

    (D) The quotation is incorrect: An increase in price causes an increase in the *quantity demanded*, not a decrease in *demand*.

3. "As the price of domestic automobiles has inched upward, customers have found foreign autos to be a better bargain. Consequently, domestic auto sales have been decreasing, and foreign auto sales have been increasing." Using only the information in this quotation and assuming everything else constant, which of the following best describes this statement?

    (A) A shift in the demand curves for both domestic and foreign automobiles

    (B) A movement along the demand curves for both foreign and domestic automobiles

    (C) A movement along the demand curve for domestic autos, and a shift in the demand curve for foreign autos

    (D) A shift in the demand curve for domestic autos, and a movement along the demand curve for foreign autos

4. You hear a fellow student say: "Economic markets are like a perpetual see-saw. If demand rises, the price rises; if price rises, then demand will fall. If demand falls, price will fall; if price falls, demand will rise and so on forever." Dispel your friend's obvious confusion in no more than one short paragraph below.

Part C

Once we have the demand curve, we can define the concept of *consumer surplus*. Consumer surplus is the value received from the purchase of a good in excess of the price paid for it, or stated differently, the difference between the amount a person is willing and able to pay and the actual price paid for each unit.

An approximation of consumer surplus can be shown graphically as the area below the demand curve above the price paid. Redraw the first demand curve (D) from Figure 9.2 on Figure 9.5.

If the price for all the quantities sold is established at $0.30, shade the area above $0.30 up to the demand curve. This is the area of consumer surplus.

Continue to use the demand curve from Figure 9.2, and assume that the price is established at $0.30. There are buyers who will benefit because they are willing and able to pay higher prices than the established price ($0.30). For example, 50 million Greebes are demanded at $0.40, but since the market price is $0.30, there is a gain to the buyers represented by this 50 million. The gain is a total of $5 million ($0.10 x 50 million = $5 million). The buyers of the next 50 million Greebes (always consider the extra or marginal buyers since the buyers at the higher prices will also be willing to buy at the lower price) are willing to pay $0.35, providing a gain of $0.05 of the consumer surplus, for a total of $2.5 million.

✳ Figure 9.5
Consumer Surplus
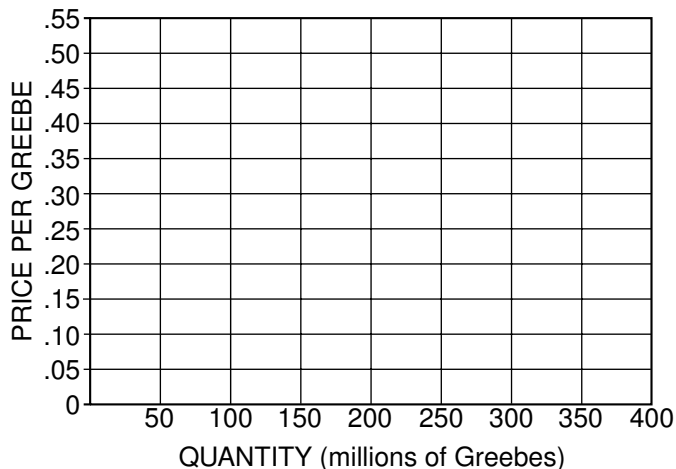
5. Approximately what will be the total consumer surplus for the buyers of the 150 million Greebes
at a price of $0.30? _____

6. If the price consumers pay increases, the shaded area (*increases / decreases*). If the price consumers
pay decreases, the shaded area (*increases / decreases*).

7. If the equilibrium price drops to $0.20, what will happen to consumer surplus?
(*Increase / Decrease*)

8. At $0.20, calculate the consumer surplus for buyers willing to pay

(A) $0.40   _____

(B) $0.35   _____

(C) $0.30   _____

(D) $0.25   _____

(E) What is the total surplus?   _____

9. Will there be any consumer surplus at a price of $0.20 for the buyers willing and able to spend
$0.20, $0.15 or $0.10? Why or why not?

Reasons for Changes in Demand

Part A

Read the eight newspaper headlines in Figure 10.2, and use the table to record the impact, if any, of each event on the demand for beef. Use the first column to the right of the headline to show whether the event causes a change in demand. Use the next column to record whether the change is an increase or a decrease in demand. In the third column, decide whether the demand curve shifts left or right. Finally, write the letter for the new demand curve. Use Figure 10.1 to help you. **Always start at curve B**, and move only one curve at a time. One headline implies that the demand for beef does not change.

✳ Figure 10.1
Beef Consumption in May
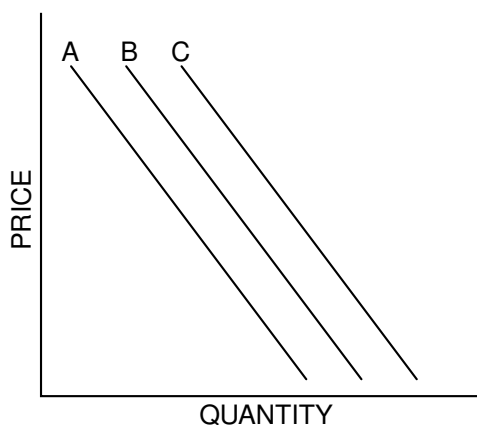
✳ Figure 10.2

Headline	Demand Shift? (Y/N)	If Demand Shifts, Inc/Dec?	Curve Shifts Left/Right?	New Curve
1. Price of Beef to Rise in June				
2. Millions of Immigrants Swell U.S. Population				
3. Pork Prices Drop				
4. Surgeon General Warns That Eating Beef Is Hazardous to Health				
5. Beef Prices Fall; Consumers Buy More				
6. Real Income for U.S. Drops for Third Month				
7. Charcoal Shortage Threatens Memorial Day Cookouts				
8. Nationwide Fad: The Disco-Burger				

Part B

Categorize each change in demand in Part A according to the reason why demand changed. A given demand curve assumes that consumer expectations, consumer tastes, the number of consumers in the market, the income of consumers, and the prices of substitutes and complements are unchanged. In the table below, place an X next to the reason that the event described in the headline caused a change in demand. One headline will have no answer because it is a change in quantity demanded.

✳ Figure 10.3

↓ Reason Headline Number →	1	2	3	4	5	6	7	8
A change in consumer expectations								
A change in consumer tastes								
A change in the number of consumers in the market								
A change in income								
A change in the price of a substitute good								
A change in the price of a complementary good								

Why Is a Demand Curve Downward Sloping?

To most people, the law of demand is obvious: Consumers buy more at a lower price and less at a higher price. Economics goes beyond describing the combined demand of all consumers in a market. To explain why a demand curve is downward sloping, or negatively sloped, economists focus on the demand curve of a single consumer.

The total utility of a quantity of goods and services to a consumer can be represented by the maximum amount of money he or she is willing to give in exchange for them. The marginal utility of a good or service to a consumer (measured in money terms) is the maximum amount of money he or she is willing to pay for one more unit of the good or service. With these definitions, we can now state a simple idea about consumer tastes: The more of a good a consumer has, the less will be the marginal utility of an additional unit.

Part A

Figure 11.1 presents data on Dolores' evaluation of different quantities of polo shirts and different quantities of steak.

1. Use the data to compute the marginal utility of each polo shirt and each steak. The numbers in the figure represent the amount of dollars Dolores is willing to pay for the polo shirts and steaks.

Figure 11.1
Marginal Utility of Polo Shirts and Steaks

Number of Polo Shirts	Total Utility	Marginal Utility	Number of Steaks	Total Utility	Marginal Utility
0	0		0	0	
1	60	60	1	20	20
2	100	40	2	36	16
3	130		3	51	
4	150		4	65	
5	165		5	78	
6	175		6	90	

2. Using Figure 11.2 (on the next page), plot Dolores' total utility and marginal utility for polo shirts and steaks. Each graph has two points to get you started.

✳ Figure 11.2
Total and Marginal Utility of Polo Shirts and Steaks
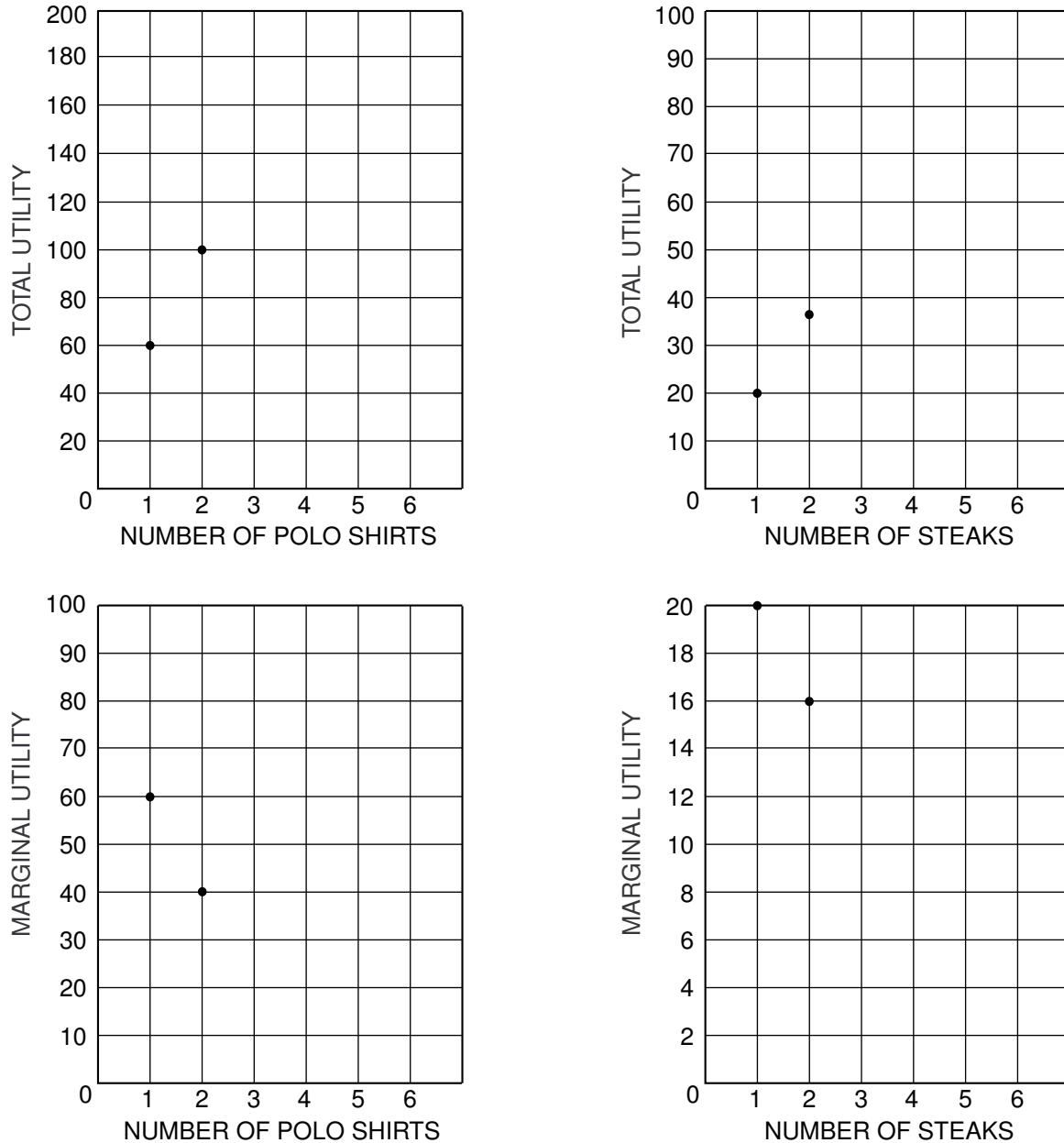
3. Looking at the chart and graphs, you can conclude:

    (A) Total utility is always (*increasing / decreasing*).

    (B) Marginal utility initially (*increases / decreases*) and eventually (*increases / decreases*).

You have demonstrated the law of *diminishing marginal utility.*

Part B

If Dolores has a given budget and must choose between polo shirts and steaks, she will make her choice so that the marginal utility per dollar spent of each good is the same. Using the data in Figure 11.1 and assuming that the price of both goods is $30, let's see what happens if Dolores spends her entire budget of $150 dollars and buys five polo shirts and no steaks. Her marginal utility from the last polo shirt is 15 and from the first steak is 20. So if she buys only four polo shirts and one steak, she loses a utility of 15 on the polo shirt but gains utility of 20 on the steak. Dolores is better off.

Suppose Dolores spends her $150 and buys four polo shirts and one steak. Her marginal utility on the last polo shirt is 20 and on the steak is also 20. She will not want to switch. To buy the next steak gives her an increase in utility of 16, but she would have to give up a polo shirt, which would reduce her utility by 20. Conversely, to buy an additional polo shirt would increase her utility by 15, but she would lose 20 from giving up the steak. Dolores should not change her purchases.

If the prices of the two goods differ, then Dolores will adjust her consumption until the marginal utilities of the two goods, *per dollar spent,* are equal. Or, stated in another way,

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

4. Use the information in Figure 11.3 to analyze Frank's choice between gasoline and food. Frank has an income of $130, the price of gasoline is $10 per gallon and the price of food is $20. Complete the table.

Figure 11.3

Gasoline	MU_g	MU_g / P_g	Food	MU_f	MU_f / P_f
1	60	6.0	1	115	5.75
2	55		2	105	
3	51		3	98	
4	48		4	94	
5	47		5	92	
6	46		6	90	

(A) Does the combination G = 1 and F = 6 satisfy the income constraint? _____

  Can Frank purchase this combination of goods with his income? _____

(B) Is this the utility maximizing combination of goods? _____

(C) In which direction would Frank like to reallocate his purchases?

(D) What is Frank's utility maximizing combination of goods, subject to the income constraint of $130?

Part C

Assume you go into a store to buy a bottle of water. The bottle of water costs you $1. You would have been willing to pay $2. The difference between what you paid and what you would have been willing to pay is *consumer surplus.*

We can calculate Dolores' consumer surplus from buying steak by looking at her demand curve. Look at her marginal utility curve for steak: At three steaks, Dolores is willing to pay $15 for one more; at four steaks, she is willing to pay $14. Dolores will buy steak until the point where the price is equal to the marginal utility of the last steak. Dolores will pay the same price for each of the steaks she buys. Thus, if the price of steak is $14, she will buy four steaks; the marginal utility of the fourth steak is $14. Dolores would have been willing to pay more for the earlier steaks. She has gotten a bargain buying four steaks at $14 apiece for a total of $56. She would have been willing to pay $20 for the first, $16 for the second, $15 for the third, and $14 for the fourth, for a total of $65. The consumer surplus is the difference between what she was willing to pay ($65) and what she paid ($56). Her consumer surplus is $9.

Consider the following information on Joel's total utility for CD purchases, and then underline the correct answer for each question that follows.

✳ Figure 11.4
Total Utility of CDs

Number of CDs	Total Utility
1	$ 25
2	$ 45
3	$ 63
4	$ 78
5	$ 90
6	$100
7	$106
8	$110

5. What marginal utility is associated with the purchase of the third CD?

    (A) $18   (B) $21   (C) $45   (D) $63

6. What is Joel's consumer surplus if he purchases three CDs at $11 apiece?

    (A) $30   (B) $33   (C) $63   (D) $96

7. What would happen to Joel's consumer surplus if he purchased an additional CD at $11?
    (A) Consumer surplus declines by $11.
    (B) Consumer surplus increases by $11.
    (C) Consumer surplus increases by $15.
    (D) Consumer surplus increases by $4.

8. How many CDs should Joel buy when they cost $11 apiece?
    (A) 0   (B) 3   (C) 5   (D) 7

9. What is Joel's consumer surplus at the optimal number of CD purchases?

    (A) $35   (B) $55   (C) $79   (D) $100

10. If CDs go on sale and their price drops to $8, how many CDs do you expect Joel to buy?

    (A) 5   (B) 6   (C) 7   (D) 8

11. Why is consumer surplus important?

Part D

Income and Substitution Effects

Another way of explaining the downward sloping demand curve is through the *income* and *substitution effects.*

Income effect: When the price of a good falls, consumers experience an increase in purchasing power. When the price of a good increases, consumers experience a decrease in purchasing power.

Substitution effect: When the price of a good changes, consumers will substitute toward the now relatively less-expensive good.

You go to your favorite burger place. The price of a burger has increased, but the price of the chicken sandwich stays the same. Over the course of a week, you generally buy both burgers and chicken sandwiches.

12. How will the increase in the price of a burger affect the purchase of burgers? Explain.

13. Describe how the substitution effect changes your purchases.

14. Describe how the income effect changes your purchases.

Supply Curves, Movements Along Supply Curves and Shifts in Supply Curves

In this activity and those that follow, we will assume that the long-run supply curve of Greebes is typically upward sloping.

Part A

Study the data in Figure 12.1 and plot the supply of Greebes on the axes in Figure 12.2. Label the supply curve S and answer the questions that follow. Write the correct answer on the answer blank, or underline the correct answer in parentheses.

✳ Figure 12.1
Supply of Greebes

Price ($ per Greebe)	Quantity Supplied (millions of Greebes)
$.15	100
.20	150
.25	200
.30	250
.35	300

✳ Figure 12.2
Supply of Greebes
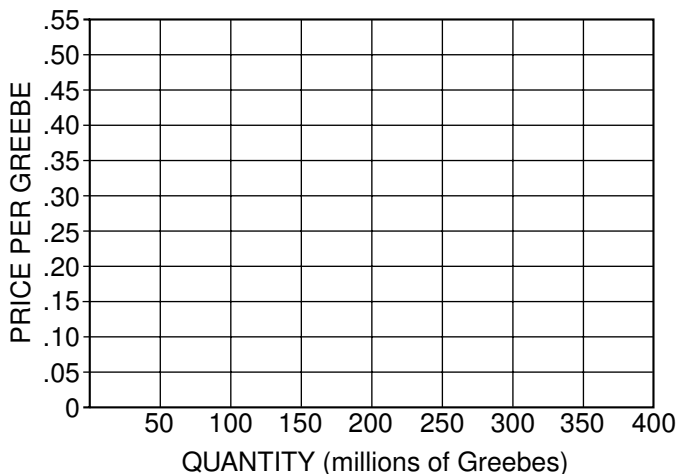
The data for supply curve S indicate that at a price of $0.25 per Greebe, suppliers would be willing to offer _____ million Greebes. Other things constant, if the price of Greebes increased to $0.30 per Greebe, suppliers would be willing to offer _____ million Greebes. Such a change would be an increase in *(supply / quantity supplied)*.

Adapted from Phillip Saunders, *Introduction to Microeconomics: Student Workbook,* 18th ed. (Bloomington, Ind., 1998). Copyright © 1998 Phillip Saunders. All rights reserved.

Other things constant, if the price of Greebes decreased to $0.20 per Greebe, suppliers would be willing to offer _____ million Greebes. Such a change would be called a decrease in *(supply / quantity supplied)*.

Now, let's suppose that there is a dramatic change in the price of several of the raw materials used in making Greebes. This change in the *ceteris paribus* conditions underlying the original supply of Greebes will result in a new set of data, such as that shown in Figure 12.3. Study the data, and plot this supply of Greebes on the axes in Figure 12.2. Label the new supply curve S_1 and answer the questions that follow.

✳ Figure 12.3
New Supply of Greebes

Price ($ per Greebe)	Quantity Supplied (millions of Greebes)
$.20	50
.25	100
.30	150
.35	200
.40	250

Comparing the new supply curve (S_1) with the original supply curve (S), we can say that a change in the supply of Greebes results in a shift of the supply curve to the *(left / right)*. Such a shift indicates that at each of the possible prices shown, suppliers are now willing to offer a *(smaller / larger)* quantity; and at each of the possible quantities shown, suppliers are willing to accept a *(higher / lower)* minimum price. The cause of this supply curve shift was a(n) *(increase / decrease)* in prices of several of the raw materials used in making Greebes.

Now, let's suppose that there is a dramatic change in the price of Silopanna, a resource used in the production of Greebes. This change in the *ceteris paribus* conditions underlying the original supply of Greebes will result in a new set of data shown in Figure 12.4. Study the data, and plot this supply of Greebes on the axes in Figure 12.2. Label the new supply curve S_2 and answer the questions that follow.

✳ Figure 12.4
New Supply of Greebes

Price ($ per Greebe)	Quantity Supplied (millions of Greebes)
$.10	150
.15	200
.20	250
.25	300
.30	350

Comparing the new supply curve (S_2) with the original supply curve (S), we can say that the change in the supply of Greebes results in a shift of the supply curve to the *(left / right)*. Such a shift indicates that at each of the possible prices shown, suppliers are now willing to offer a *(smaller / larger)* quantity;

and at each of the possible quantities shown, suppliers are willing to accept a *(lower / higher)* mini-mum price. The cause of this supply curve shift is a(n) *(increase / decrease)* in the price of Silopanna, a resource used in the production of Greebes.

Part B

Now, to check your understanding, underline the answer you think is the one best alternative in each of the following multiple-choice questions.

1. Other things constant, which of the following would *not* cause a change in the long-run supply of beef?
   (A) A decrease in the price of beef
   (B) A decrease in the price of cattle feed
   (C) An increase in the price of cattle feed
   (D) An increase in the cost of transporting cattle to market

2. "Falling oil prices have caused a sharp decrease in the supply of oil." Speaking precisely, and using terms as they are defined by economists, choose the statement that best describes this quotation.
   (A) The quotation is correct: A decrease in price always causes a decrease in *supply*.
   (B) The quotation is incorrect: A decrease in price always causes an increase in *supply*, not a decrease in *supply*.
   (C) The quotation is incorrect: A decrease in price causes an increase in the *quantity supplied*, not a decrease in *supply*.
   (D) The quotation is incorrect: A decrease in price causes a decrease in the *quantity supplied*, not a decrease in *supply*.

3. You overhear a fellow student say: "Economic markets are like a slide: If supply increases, the price increases; if the price increases, then supply will fall. If supply falls, the price will rise; if the price increases, supply will increase and so on forever." Dispel your friend's obvious confusion (in no more than one short paragraph) below.

Part C

Once we have the supply curve, we can define the concept of *producer surplus*. Producer surplus is the amount a seller is paid minus the seller's cost. An approximation of producer surplus can be shown graphically as the area below the equilibrium price and above the supply curve.

4. Redraw the first supply curve (S) from Figure 12.2 on Figure 12.5. If the price for all the quantities sold is established at $0.30, shade the area below $0.30 down to the supply curve. This is the area of producer surplus.

✳ Figure 12.5
Producer Surplus
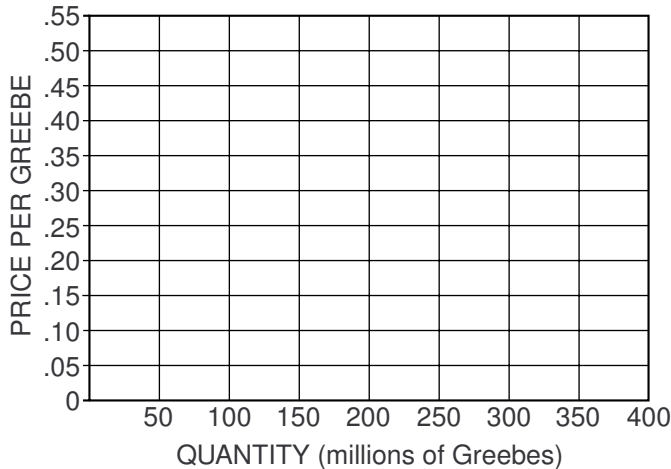
5. Underline the correct answer in parentheses for these questions and for similar questions below.

   (A) If the equilibrium price increases, the shaded area (*increases / decreases*).

   (B) If the equilibrium price decreases, the shaded area (*increases / decreases*).

6. Continue to use the supply curve from Figure 12.2 and assume that the selling price is established at $0.25. There are producers who will benefit because some are willing to offer Greebes for a price lower than the established price ($0.25). For example, 100 million Greebes are supplied at $0.15, but since the market price is $0.25, producer surplus for the first 100 million will be $10 million: ($0.25 – $0.15) x 100. Sellers of the next 50 million Greebes (always consider the extra or marginal sellers since the sellers at the lower prices will also be willing to sell at the higher price) are willing to sell Greebes for $0.20, providing a gain of $0.05 for each, resulting in a producer surplus of $2.5 million.

   (A) Approximately what will be the total producer surplus for the sellers if the price is $0.25?

   (B) If a seller's price were to increase to $0.30, what will happen to producer surplus?
      (*Increase / Decrease*)

   (C) Calculate the producer surplus for sellers willing to offer

      $0.15   _____

      $0.20   _____

      $0.25   _____

      $0.30   _____

      What is the total surplus?   _____

Reasons for Changes in Supply

Part A

Read the eight newspaper headlines in Figure 13.2, and record the impact, if any, of each event on the supply of cars. Use the first column to the right of the headline to show whether the event will cause a change in supply. Use the next column to record whether the change is an increase or a decrease in supply. In the third column, decide whether the supply curve shifts left or right. Finally, write the letter for the new supply curve. Use Figure 13.1 to help you. **Always start at curve B,** and move only one curve at a time. Two headlines imply that the supply of cars does not change.

✳ Figure 13.1
Supply of Foreign and Domestic Cars
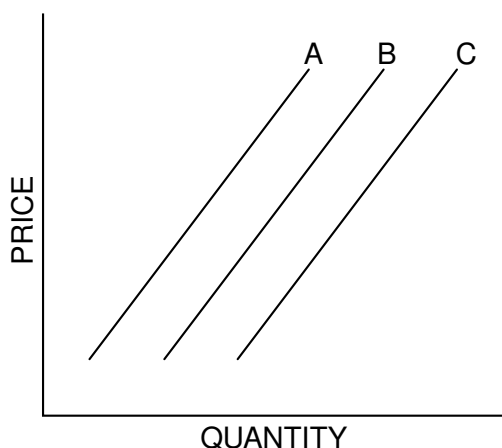
✳ Figure 13.2

Headline	Supply Shift? (Y/N)	If Supply Shifts, Inc/Dec?	Curve Shifts Left/Right?	New Curve
1. Auto Workers' Union Agrees to Wage Cuts				
2. New Robot Technology Increases Efficiency				
3. Nationwide Auto Strike Began at Midnight				
4. New Import Quotas Reduce Foreign Car Imports				
5. Cost of Steel Rises				
6. Auto Producer Goes Bankrupt; Closes Operation				
7. Buyers Reject New Models				
8. National Income Rises 2%				

From *Master Curriculum Guide in Economics: Teaching Strategies for High School Economics Courses* (New York: National Council on Economic Education, 1985), p. 69

Part B

Categorize each change in supply in Part A according to the reason why supply changed. In Figure 13.3, place an X next to the reason that the headline indicated a change in supply. In some cases, more than one headline could be matched to a reason. Two headlines do not indicate a shift in supply.

✳ Figure 13.3

↓ Reason Headline Number →	1	2	3	4	5	6	7	8
A change in costs of inputs to production process								
A change in technology								
A change in the number of producers in the market								
Government policies								

Equilibrium Price and Equilibrium Quantity

Figure 14.1 below shows the demand for Greebes and the supply of Greebes. Plot these data on the axes in Figure 14.2. Label the demand curve D and label the supply curve S. Then answer the questions that follow. Fill in the answer blanks, or underline the correct answer in parentheses.

✳ Figure 14.1
Demand for and Supply of Greebes

Price ($ per Greebe)	Quantity Demanded (millions of Greebes)	Quantity Supplied (millions of Greebes)
$.15	300	100
.20	250	150
.25	200	200
.30	150	250
.35	100	300

✳ Figure 14.2
Demand for and Supply of Greebes
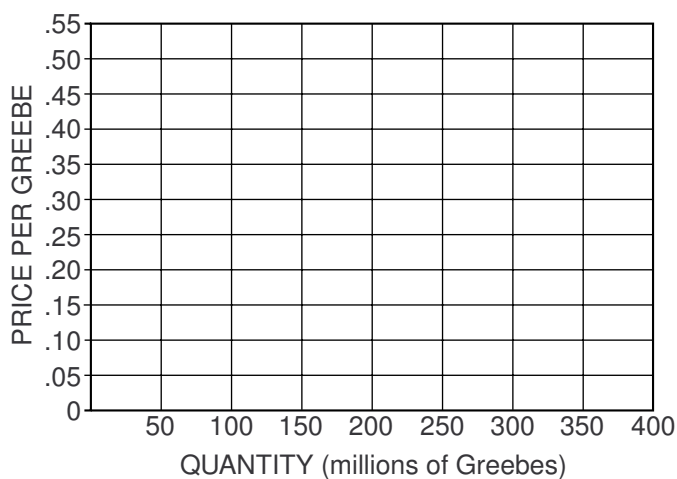
1. Under these conditions, competitive market forces would tend to establish an equilibrium price of _____ per Greebe and an equilibrium quantity of _____ million Greebes.

2. If the price currently prevailing in the market is $0.30 per Greebe, buyers would want to buy _____ million Greebes and sellers would want to sell _____ million Greebes. Under these conditions, there would be a (*shortage / surplus*) of _____ million Greebes. Competitive market forces would tend to cause the price to (*increase / decrease*) to a price of _____ per Greebe.

   At this new price, buyers would now want to buy _____ million Greebes, and sellers now want to sell _____ million Greebes. Because of this change in (*price / underlying conditions*), the

(*demand / quantity demanded*) changed by _____ million Greebes, and the
(*supply / quantity supplied*) changed by _____ million Greebes.

3. If the price currently prevailing in the market is $0.20 per Greebe, buyers would want to buy
_____ million Greebes, and sellers would want to sell _____ million Greebes. Under these
conditions, there would be a *(shortage / surplus)* of _____ million Greebes. Competitive market
forces would tend to cause the price to *(increase / decrease)* to a price of _____ per Greebe.
At this new price, buyers would now want to buy _____ million Greebes, and sellers now
want to sell _____ million Greebes. Because of this change in *(price / underlying conditions)*,
the (*demand / quantity demanded*) changed by _____ million Greebes, and the
(*supply / quantity supplied*) changed by _____ million Greebes.

4. Lightly shade the area of consumer surplus and producer surplus.

   (A) If the government sets the price at $0.35 and the quantity exchanged is 100 million Greebes,
   what will happen to the size of the combined total of consumer and producer surplus?

   (B) What does this say about the market system?

5. Now, suppose a mysterious blight causes the supply schedule for Greebes to change to the
following:

※ Figure 14.3
New Supply of Greebes

Price ($ per Greebe)	Quantity Supplied (millions of Greebes)
$.20	50
.25	100
.30	150
.35	200

   Plot the new supply schedule on the axes in Figure 14.2 and label it S_1. Label the new equilibrium
E_1. Under these conditions, competitive market forces would tend to establish an equilibrium price of
_____ per Greebe and an equilibrium quantity of _____ million Greebes.

   Compared with the equilibrium price in Question 1, we say that because of this change in
(price / underlying conditions), the *(supply / quantity supplied)* changed; and both the equilibrium
price and the equilibrium quantity changed. The equilibrium price *(increased / decreased)*, and the
equilibrium quantity *(increased / decreased)*.

   Compared with the consumer and producer surpluses in Question 4, consumer surplus has
(increased / decreased), and producer surplus has *(increased / decreased)*.

6. Now, with the supply schedule at S_1, suppose further that a sharp drop in people's incomes as the result of a prolonged recession causes the demand schedule to change to the following:

✳ Figure 14.4
New Demand for Greebes

Price ($ per Greebe)	Quantity Demanded (millions of Greebes)
$.15	200
.20	150
.25	100
.30	50

Plot the new demand schedule on the axes in Figure 14.2 and label it D_1. Label the new equilibrium E_2. Under these conditions, with the supply schedule at S_1 , competitive market forces would tend to establish an equilibrium price of _____ per Greebe and an equilibrium quantity of _____ million Greebes. Compared with the equilibrium price in Question 5, because of this change in *(price / underlying conditions)*, the *(demand / quantity demanded)* changed. The equilibrium price *(increased / decreased)*, and the equilibrium quantity *(increased / decreased)*.

Shifts in Supply and Demand

Part A

Fill in the blanks with the letter of the graph that illustrates each situation. You may use a graph more than once.

❋ Figure 15.1
Jelly Beans Supply and Demand
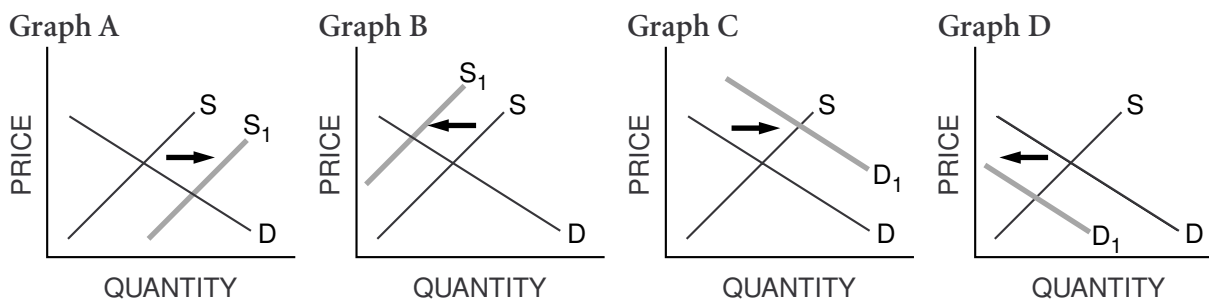
1. The price of sugar increases. _____

2. The price of bubble gum, a close substitute for jelly beans, increases. _____

3. A machine is invented that makes jelly beans at a lower cost. _____

4. The government places a tax on foreign jelly beans, which have a considerable share of the market. _____

5. The price of soda, a complementary good for jelly beans, increases. _____

6. Widespread prosperity allows people to buy more jelly beans. _____

Part B

Connecticut ships large amounts of apples to all parts of the United States by rail. Circle the words that show the effects on price and quantity for each situation, and complete the graphs below, showing how a hurricane that destroys apples before they are picked in Connecticut might affect the price and quantity of each commodity. Then provide your reasoning.

7. **Apples in Boston**

   Price: Rises   Unchanged   Falls

   Quantity: Rises   Unchanged   Falls
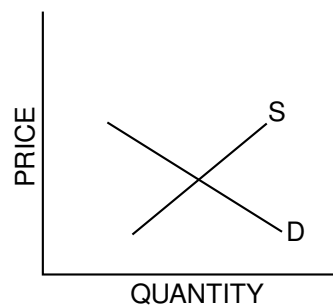
   Reason:

8. **Land devoted to apple orchards in the state of Washington**

   Price: Rises   Unchanged   Falls

   Quantity: Rises   Unchanged   Falls
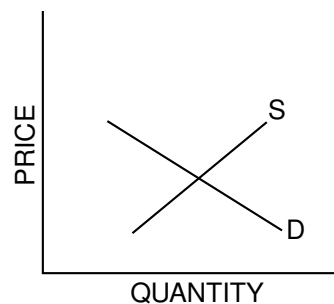
   Reason:

9. **Apples grown in the state of Washington**

   Price: Rises   Unchanged   Falls

   Quantity: Rises   Unchanged   Falls
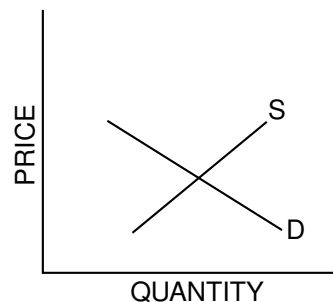
   Reason:

10. **Pears**

Price:	Rises	Unchanged	Falls
Quantity:	Rises	Unchanged	Falls
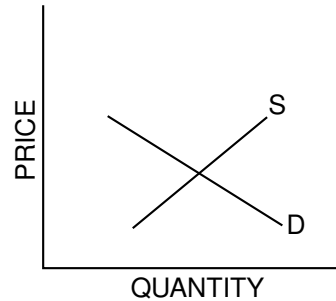
Reason:

11. **Apple pies**

Price:	Rises	Unchanged	Falls
Quantity:	Rises	Unchanged	Falls

Reason:
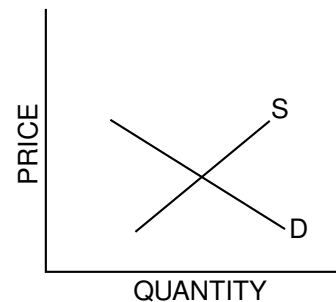
How Markets Allocate Resources

The following questions refer to a group of related markets in the United States during a long period of time. Assume that the markets are perfectly competitive and that the supply and demand model is completely applicable. The figures show the supply and demand in each market *before* the assumed change occurs. Trace through the effects of the assumed change, *other things constant.* Work your way from left to right. Shift only one curve in each market. For each market, draw whatever new supply or demand curves are needed, labeling each new curve S_1 or D_1. Then circle the correct symbol under each diagram ($\uparrow$ for increase, — for unchanged, and $\downarrow$ for decrease). Remember to shift only one curve in each market.

1. Assume that a new fertilizer dramatically increases the number of potatoes that can be harvested with no additional labor or machinery. Also assume that this fertilizer does not affect wheat farming and that people are satisfied to eat either potatoes or bread made from wheat flour.

✳ Figure 16.1
Effects of a New Fertilizer
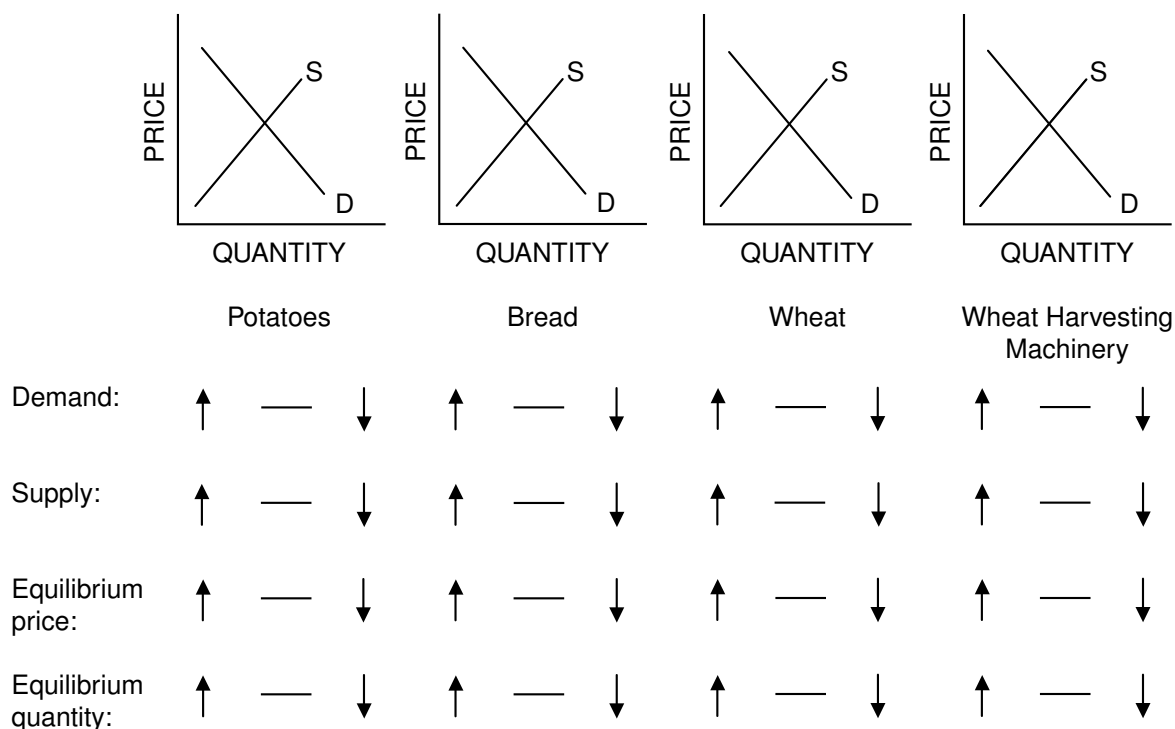
	Potatoes	Bread	Wheat	Wheat Harvesting Machinery
Demand:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Supply:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium price:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium quantity:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓

Adapted from Phillip Saunders, *Introduction to Microeconomics: Student Workbook,* 18th ed. (Bloomington, Ind., 1998).

2. Assume people's tastes change and there is an increase in the demand for briefcases and luggage made of leather. How would this affect the leather market and related markets? Draw the new curves and circle the appropriate symbols in all four markets.

✳ Figure 16.2
Effects of Increased Demand for Briefcases and Luggage

	Leather	Leather Shoes	Shoelaces for Leather Shoes	Shoelace Packaging Machinery
Demand:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Supply:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium price:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium quantity:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
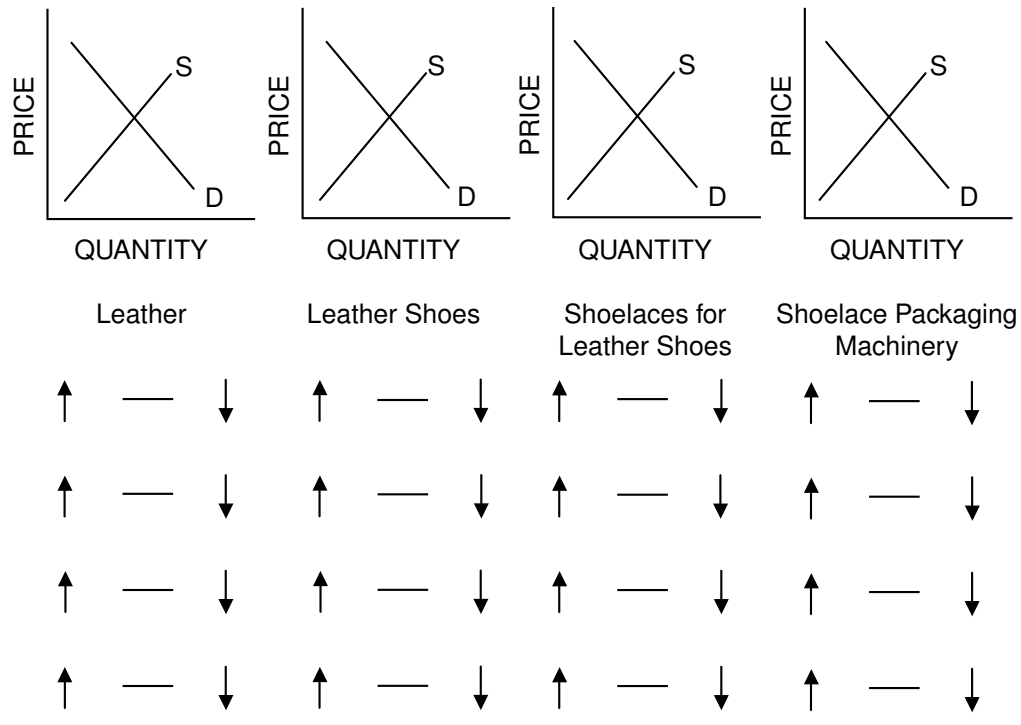
3. Assume that a heavy frost destroys half the world's coffee crop and that people use more cream in coffee than they do in tea.

✳ Figure 16.3
Effects of a Loss of Coffee Crop

	Coffee	Tea	Cream	Automatic Coffee Makers
Demand:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Supply:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium price:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium quantity:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
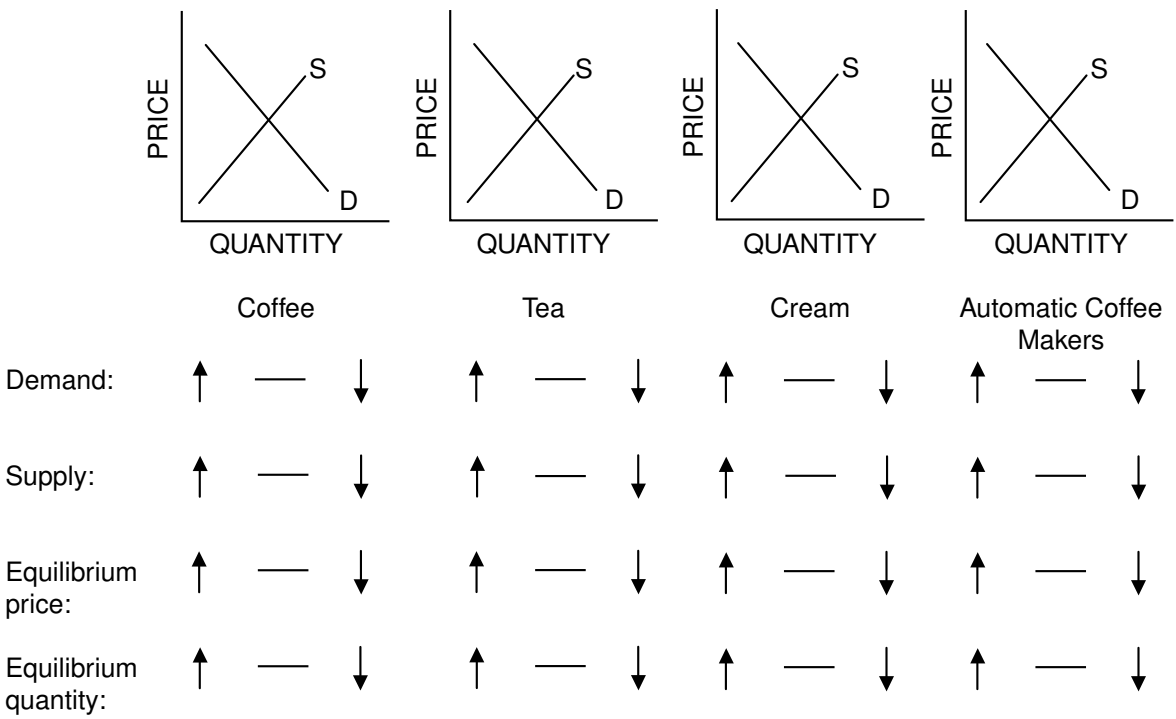
4. Assume people's tastes change in favor of colored sports shirts, which are worn without neckties, and against white dress shirts, which are worn with neckties and tie clasps.

✳ Figure 16.4
Effects of a Shift to Sports Shirts

	Sport Shirts	Dress Shirts	Neckties	Tie Clasps
Demand:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Supply:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium price:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
Equilibrium quantity:	↑ — ↓	↑ — ↓	↑ — ↓	↑ — ↓
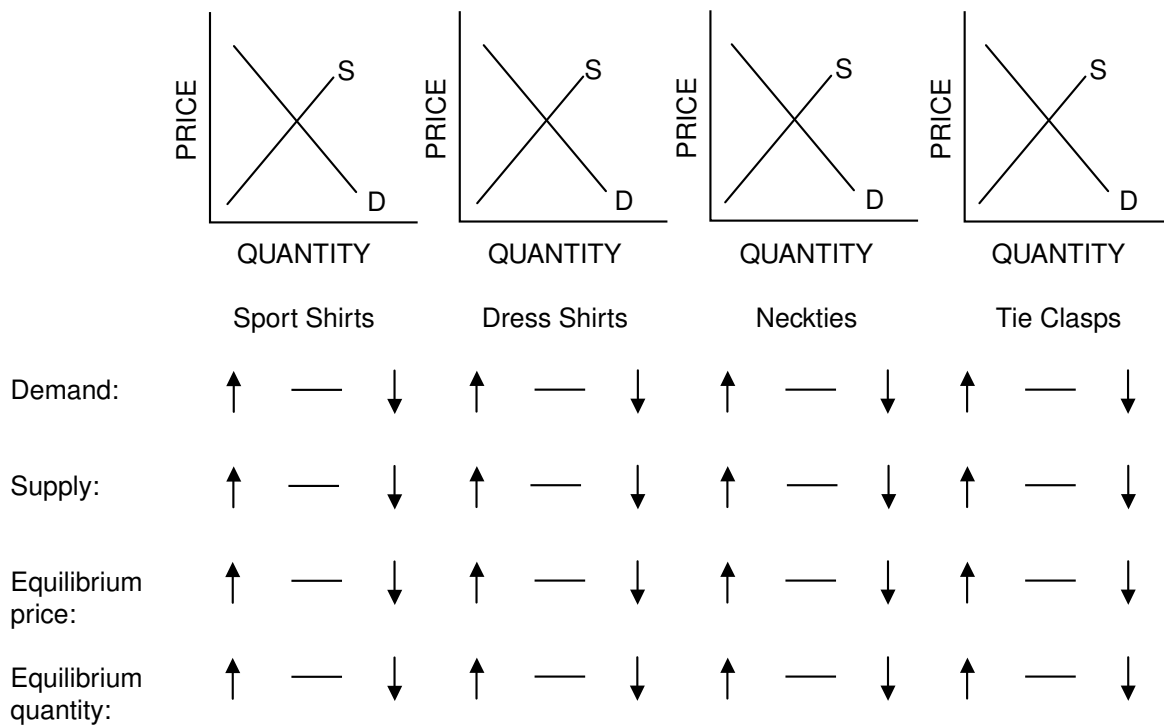
Elasticity: An Introduction

In many circumstances, it is not enough for an economist, policymaker, firm or consumer to simply know the direction in which a variable will be moving. For example, if I am a producer, the law of demand tells me that if I increase the price of my good, the quantity demanded by consumers will decrease. The law of demand doesn't tell me what will happen to my total revenue (the price of the good times the number of units sold), however. Whether total revenue increases or decreases depends on how responsive the quantity demanded is to the price change. Will it decrease a little? A lot? Throughout the discipline of economics, in fact, the responsiveness of one variable to changes in another variable is an important piece of information. In general, *elasticity* is a measurement of how responsive one variable is to a change in another variable — that is, how elastic one variable is given a change in the other, *ceteris paribus* (that is, holding all other variables constant).

Because elasticity measures responsiveness, changes in the variables are measured relative to some base or starting point. Consider the following elasticity measurements:

The price elasticity of demand, ε_d:
$$\varepsilon_d = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ price}$$

The income elasticity of demand, ε_d:
$$\varepsilon_d = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ income}$$

The price elasticity of supply, ε_s:
$$\varepsilon_s = \frac{percentage\ change\ in\ quantity\ supplied}{percentage\ change\ in\ price}$$

The wage elasticity of labor supply, ε_{ls}:
$$\varepsilon_{ls} = \frac{percentage\ change\ in\ quantity\ of\ labor\ supplied}{percentage\ change\ in\ wage}$$

Activity written by Kelly A. Chaston, Davidson College, Davidson, N.C.

Part A
Extra-Credit Problems

1. Now, suppose that your economics teacher currently allows you to earn extra credit by submitting answers to the end-of-the-chapter questions in your textbook. The number of questions you're willing to submit depends on the amount of extra credit for each question. How responsive you are to a change in the extra-credit points the teacher gives can be represented as an *elasticity*. Write the formula for the elasticity of extra-credit problems submitted:

$$\varepsilon_{ps} = \text{\underline{\hspace{5cm}}}$$

2. Now, consider that your teacher's goal is to get you to submit twice as many questions: a 100-percent increase. Underline the correct answer in parentheses.

   (A) If the number of chapter-end questions you submit *is* very responsive to a change in extra-credit points, then a given increase in extra credit elicits a large increase in questions submitted. In this case, your teacher will need to increase the extra-credit points by (*more than* / *less than* / *exactly*) 100 percent.

   (B) If the number of chapter-end questions you submit *is not* very responsive to a change in extra-credit points, then a given increase in extra credit elicits a small increase in questions submitted. In this case, your teacher will need to increase the extra-credit points by (*more than* / *less than* / *exactly*) 100 percent.

Part B
The Price Elasticity of Demand

It's easy to imagine that there are many applications for the elasticity concept. Here we will concentrate on the price elasticity of demand for goods and services. For convenience, the measure is repeated here:

$$\varepsilon_d = \frac{\textit{percentage change in quantity demanded}}{\textit{percentage change in price}}$$

Note the following points:

■ Price elasticity of demand is always measured *along* a demand curve. When measuring the responsiveness of quantity demanded to a change in price, all other variables must be held constant.

■ The price elasticity of demand is typically reported as a positive number, even though the calculation itself is negative; price and quantity demanded move in opposite directions.

■ Along a linear demand curve, there are price ranges over which demand is elastic, unit elastic and inelastic.

✳ Figure 17.1
Relationship Between Changes in Quantity Demanded and Price

Percentage change in quantity demanded	>	percentage change in price	> 1	Elastic
Percentage change in quantity demanded	=	percentage change in price	= 1	Unit elastic
Percentage change in quantity demanded	<	percentage change in price	< 1	Inelastic

Part C

Calculating the Arc Elasticity Coefficient

The arc elasticity calculation method is obtained when the midpoint or average price and quantity are used in the calculation. This is reflected in the formula below.

$$\varepsilon_d = \frac{\textit{percentage change in quantity demanded}}{\textit{percentage change in price}} = \frac{\dfrac{Q - Q_1}{(Q + Q_1)/2}}{\dfrac{P - P_1}{(P + P_1)/2}} = \frac{\dfrac{\Delta Q}{(Q + Q_1)/2}}{\dfrac{\Delta P}{(P + P_1)/2}}$$

If we have the consumer's or market demand curves, we can precisely calculate the elasticity value, or coefficient. Suppose that price is increased (decreased) from P to P_1 and so quantity demanded decreases (increases) from Q to Q_1.

✳ Figure 17.2

Calculating the Arc Elasticity Coefficient
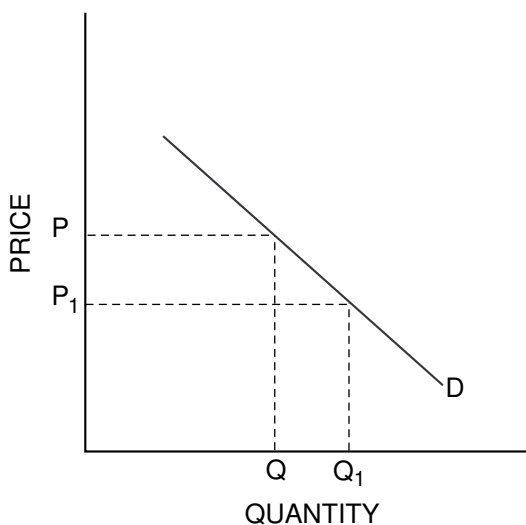
By making all numbers positive, we've in effect taken the absolute values of these changes, and so the elasticity coefficient will be positive. Note that we have used the average of the two prices and the two quantities. We have done this so that the elasticity measured will be the same whether we are moving from Q to Q_1 or the other way around.

Part D
Coffee Problems

Suppose Moonbucks, a national coffee-house franchise, finally moves into the little town of Middle-ofnowhere. Moonbucks is the only supplier of coffee in town and faces the following demand schedule each week. Write the correct answer on the answer blanks, or underline the correct answer in parentheses.

Figure 17.3
Cups of Coffee Demanded per Week

Price (per cup)	Quantity Demanded
$6	80
5	100
4	120
3	140
2	160
1	180
0	200

3. What is the arc price elasticity of demand when the price changes from $1 to $2? _____

$$\varepsilon_d \ = \ \frac{\dfrac{\Delta Q}{(Q + Q_1)/2}}{\dfrac{\Delta P}{(P + P_1)/2}} \ = \ \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}} \ = \ \rule{3cm}{0.4pt}$$

So, over this range of prices, demand is (*elastic / unit elastic / inelastic*).

4. What is the arc price elasticity of demand when the price changes from $5 to $6? _____

$$\varepsilon_d \ = \ \frac{\dfrac{\Delta Q}{(Q + Q_1)/2}}{\dfrac{\Delta P}{(P + P_1)/2}} \ = \ \frac{\rule{2cm}{0.4pt}}{\rule{2cm}{0.4pt}} \ = \ \rule{3cm}{0.4pt}$$

So, over this range of prices, demand is (*elastic / unit elastic / inelastic*).

Note: Because the relationship between quantity demanded and price is inverse, price elasticity of demand would always be negative. Economists believe using negative numbers is confusing when referring to "large" or "small" elasticities of demand. Therefore, they use absolute or positive numbers, changing the sign on the negative numbers.

Part E

Now, consider Figure 17.4, which graphs the demand schedule given in Figure 17.3.
Recall the slope of a line is measured by the rise over the run: slope = rise / run = $\Delta P / \Delta Q$.

✳ Figure 17.4
Elasticity of Demand for Coffee
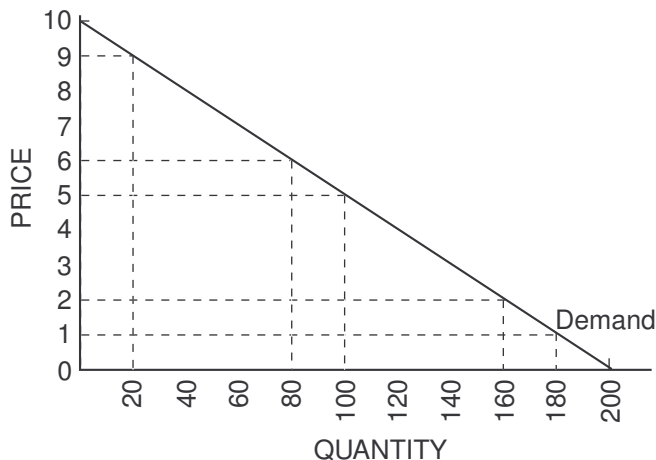
5. Using your calculations of ΔP and ΔQ from Question 3, calculate the slope of the demand curve.
   _____

6. Using your calculations of ΔP and ΔQ from Question 4, calculate the slope of the demand curve.
   _____

7. The law of demand tells us that an increase in price results in a decrease in the quantity demanded. Questions 5 and 6 remind us that the slope of a straight line is *constant everywhere along the line.* Along this demand curve, a change in price of $1 generates a change in quantity demanded of 20 cups of coffee a week.

   You've now shown mathematically that while the slope of the demand curve is related to elasticity, the two concepts are not the same thing. Briefly discuss the relationship between where you are along the demand curve and the elasticity of demand. How does this tie into the notion of *responsiveness*?

The Determinants of Elasticity of Demand

Suppose we don't know the precise demand schedule for electricity and there is a 20 percent increase in the price of a kilowatt hour of electricity. We know that quantity demanded will decrease, but will it be by less than 20 percent (inelastic demand), exactly 20 percent (unit elastic) or more than 20 percent (elastic demand)? What factors influence the price elasticity of demand? (Remember, *ceteris paribus*!)

Part A

Consider the following representative households in our market for electricity:

Household A: Uses electricity for lighting, appliances and heating.

Household B: Uses electricity for lighting, appliances and heating. Has a heating system that can, with one day's labor, be switched to burn natural gas.

1. Household _____ will have the more elastic demand because of the presence of a _____ good.

2. Because Household A has no available substitutes, should we assume that the quantity demanded of electricity will remain unchanged given the increase in price? _____

   Do you think Household A's response will be elastic or inelastic? _____

3. Illustrate the same concept identified above by placing a 1, 2 or 3 by each item below, denoting the least price elastic to the most price elastic. Explain your reasoning.

   _____ Demand for insulin

   _____ Demand for Granny Smith apples

   _____ Demand for running shoes

   Rationale:

4. To summarize: Demand is (*more / less*) elastic for goods with many available substitutes.

_____

Activity written by Kelly A. Chaston, Davidson College, Davidson, N.C.

Part B

Consider the following representative households in the electricity market:

Household A: Currently spends $300 a month on electricity.
The household income is $1,200 a month.

Household B: Currently spends $300 a month on electricity.
The household income is $3,600 a month.

5. Household _____ will have the more-elastic demand, as the expenditures on this good account for a *(smaller / larger)* proportion of its income.

6. Illustrate the same concept identified above by placing a 1, 2 or 3 by each item below, denoting the least elastic to the most elastic. Explain your reasoning.

_____ Demand for chewing gum

_____ Demand for automobiles

_____ Demand for clothing

Rationale:

7. To summarize: Goods that command a *(small / large)* proportion of a consumer's income tend to be more price elastic.

Part C

We expect that the price elasticity of demand will also vary with the nature of the good being considered. Is it a necessity? A durable good? Are we considering the short run or the long run? Consider the following alternatives, and underline the option that correctly completes each statement.

8. The price elasticity of demand for cigarettes: A product that is considered to be a necessity will have a relatively price *(elastic / inelastic)* demand.

9. The price elasticity of demand for automobiles: In the short run, consumers can postpone the purchase of durable goods, and so such goods will have a relatively price *(elastic / inelastic)* demand.

10. Briefly summarize how the nature of the good — necessity, durable good or luxury good — and the time frame affect the price elasticity of demand for electricity.

Part D

Now, suppose that prices in the market for electricity remain constant, but consumers' income increases by 30 percent. Again, we may not know the precise demand schedule but may still be able to use notions of elasticity to speculate about what will happen to demand.

Recall the income elasticity of demand, ε_d:

$$\varepsilon_{d=} \frac{\textit{percentage change in quantity demanded}}{\textit{percentage change in income}}$$

Note in this case, income and quantity demanded are the relevant variables. All other variables, including the price of electricity, are held constant.

11. In measurements of elasticity, if income and quantity demanded move in the opposite direction — that is, if one increases while the other decreases — then the elasticity coefficient will be (*positive / negative*).

12. Remember that if income increases, the demand for a normal good increases and demand for an inferior good decreases. If the good is a normal good, income elasticity will be (*negative / positive*). If it is an inferior good, income elasticity will be (*negative / positive*).

Elasticity and Total Revenue

Consider the following: total revenue (TR) = price (P) x quantity demanded (Q_d).

The responsiveness of quantity demanded to changes in price will determine whether a price increase leads to an increase or decrease in the total revenue generated.

The law of demand tells us that a price increase (decrease) will result in a decrease (increase) in quantity demanded: They move in opposite directions. What happens to TR when price changes is determined by the dominant effect, either the price effect or the quantity effect. In this case, knowing the price elasticity of demand solves the problem.

Consider that

$\varepsilon_d < 1 \implies$ %Δ in $Q_d < $ % Δ in price $\implies$ The *price effect* dominates.
If price is increasing ($Q_d \downarrow$ by less), TR will increase.
If price is decreasing ($Q_d \uparrow$ by less), TR will decrease.

$\varepsilon_d = 1 \implies$ %Δ in $Q_d = $ % Δ in price $\implies$ Neither effect dominates. TR remains unchanged.

$\varepsilon_d > 1 \implies$ %Δ in $Q_d > $ % Δ in price $\implies$ The *quantity effect* dominates.
If price is increasing ($Q_d \downarrow$ by more), TR will decrease.
If price is decreasing ($Q_d \uparrow$ by more), TR will increase.

Use this information to do the problems below. Fill in the blank or underline the correct answer.

1. Price rises from P = $5 to P_1 = $6, and quantity demanded decreases from Q = 15 to Q_1 = 10.

    (A) The coefficient of elasticity equals _____ .

    (B) P   x   Q   =   TR

        ___   x   ___   =   ___

    (C) P_1 x Q_1 = TR_1

        ___   x   ___   =   ___

    (D) P ($\downarrow$ / $\uparrow$);   TR($\downarrow$ / $\uparrow$)   Demand is (*elastic* / *unit elastic* / *inelastic*).

2. Price decreases from P = $10 to P_1 = $9, and quantity demanded increases from Q = 100 to Q_1 = 110.

    (A) The coefficient of elasticity equals _____ .

    (B) P   x   Q   =   TR

        ___   x   ___   =   ____

    (C) P_1 x Q_1 = TR_1

        ___   x   ___   =   ____

    (D) P($\downarrow$ / $\uparrow$);   TR ($\downarrow$ / $\uparrow$)   Demand is (*elastic* / *unit elastic* / *inelastic*).

Activity written by Kelly A. Chaston, Davidson College, Davidson, N.C.

Applying Elasticity to the Real World

Each of the following stories contains an assumption about elasticity of demand. In (A) for each story, decide whether the person's conclusion is right or wrong. In (B) explain your reasoning.

1. I.M. Politico, a candidate for the state legislature, is proposing a large increase in the tax on cigarettes and liquor. He says, "I'm not proposing these taxes to raise revenue but to discourage reckless drinking and the filthy smoking habit. If the prices of cigarettes and liquor go up, most people will quit using them. After all, no one needs to drink or smoke."

   (A)

   (B)

2. U.R. Kool, a candidate for Congress, proposes freezing the price of gasoline. "There is no substitute for gasoline," he says. "People have to get from one place to another. Economists who say higher prices will discourage people from buying as much gas as before don't live in the real world."

   (A)

   (B)

3. Councilman Vic Acqua opposed a price increase for water during a recent drought. He claimed that there is no substitute for water. He believes an increase in the price of water (water taxes) will result in the same quantity of water used as before the price went up.

   (A)

   (B)

4. Sky King, world traveler, says if the airlines want to increase total revenue, they should lower fares for business travelers as well as for vacationers. Both groups should respond equally to a price decrease.

   (A)

   (B)

Excise Taxes

Suppose Figures 21.1 and 21.2 show the current supply of Greebes.

✳ Figure 21.1
Table of Current Supply Schedule of Greebes

Quantity (millions)	Supply Price Before Tax ($ per Greebe)	Supply Price After Tax ($ per Greebe)
50	$.10	
100	.15	
150	.20	
200	.25	
250	.30	
300	.35	

✳ Figure 21.2
Current Supply Schedule of Greebes
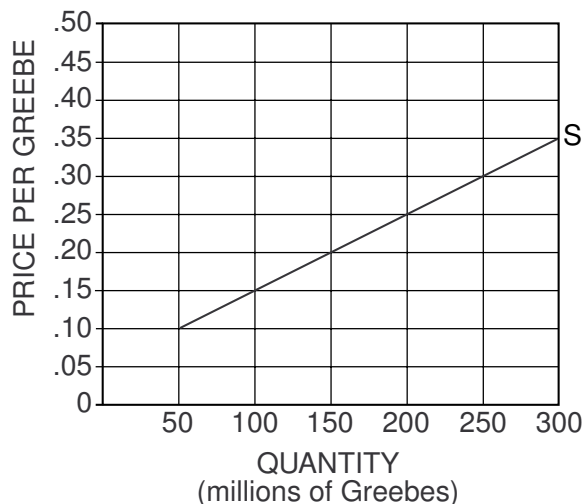
Now, suppose that (to raise revenue for higher education) the government enacts an excise (sales) tax of $0.15 per Greebe. *This tax will result in a new supply curve for Greebes.* To determine where this new supply curve lies, reason as follows: If before the tax, firms were willing to supply 50 million Greebes at a price of $0.10, they would now be willing to supply 50 million Greebes only if the price were $0.25. (Remember: $0.15 of the price of each Greebe sold is now going to go to the government. So, if the price is $0.25 and the government is getting $0.15 of this price, then the seller is receiving the remaining $0.10.)

Fill in the blank spaces in the table, and draw in the new supply curve that results from the tax. Label the new supply curve S_T.

What will be the result of this excise (sales) tax on the equilibrium quantity of Greebes? The equilibrium price paid by buyers (P_B)? The equilibrium price received by sellers (P_S)? The revenue received by the government? The income, or revenue, received by sellers after the tax?

The answers to these important questions will depend on the nature of the demand for Greebes. The next section of this activity will help you determine the effects of a $0.15 excise tax on Greebes under four different demand conditions.

Part A

✳ Figure 21.3
Relatively Inelastic Demand for Greebes as Compared with D_1 on Figure 21.4
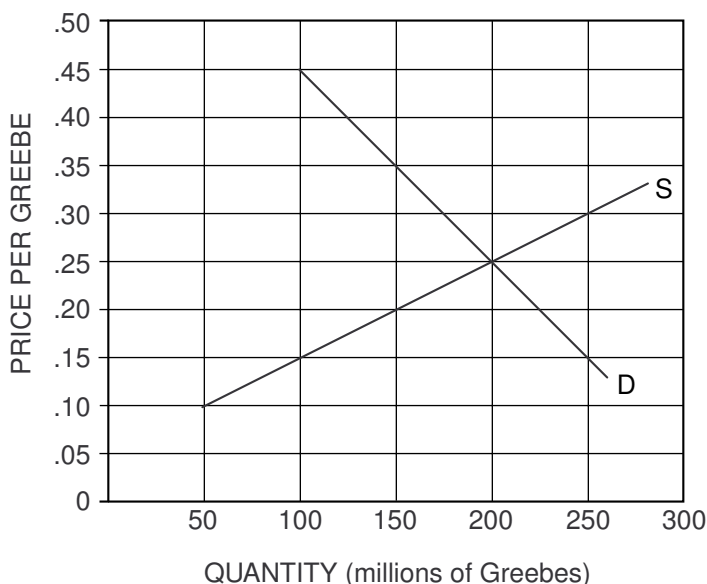
1. On Figure 21.3 above, the equilibrium quantity of Greebes is _____ million Greebes.

2. On Figure 21.3, the equilibrium price of Greebes is _____ per Greebe.

3. Buyers are spending a total of _____ million on Greebes.

4. Sellers are receiving a total of _____ million from selling Greebes.

5. If an excise tax of $0.15 for each Greebe sold is levied on the sellers of Greebes, the equilibrium price paid by buyers (P_B) will differ from the equilibrium price received by sellers (P_S) by the amount of the tax. Add the new supply curve incorporating the tax to the graph and indicate P_B and P_S. This $0.15 goes to the government. Under these circumstances:

   (A) The new equilibrium quantity of Greebes would be _____ million.

   (B) The new equilibrium price paid by buyers would be _____ per Greebe.

(C) The new equilibrium price received by sellers (after tax) would be _____ per Greebe.

(D) Buyers would spend a total of _____ million on Greebes.

(E) Sellers would receive a total of _____ million (after tax) from selling Greebes.

(F) The government revenue from this tax would be _____ million.

(G) _____ million of this revenue would be paid by buyers in the form of higher prices.

(H) _____ million of this revenue would be paid by sellers in the form of reduced income.

(I) As a result of the tax, buyers will buy a smaller quantity than before the tax. If so, the sellers would also have a loss of revenue that is not collected by the government. In this case, the *uncollected revenue loss* would be equal to _____ million.

Part B

✳ Figure 21.4
Relatively Elastic Demand for Greebes as Compared with D in Figure 21.3

6. On Figure 21.4, the equilibrium quantity of Greebes is _____ million.

7. On Figure 21.4, the equilibrium price of Greebes is _____ per Greebe.

8. Buyers are spending a total of _____ million on Greebes.

9. Sellers are receiving a total of _____ million from selling Greebes.

10. If an excise tax of $0.15 for each Greebe sold is levied on the sellers of Greebes, the equilibrium price paid by buyers (P_B) will differ from the equilibrium price received by sellers (P_S) by the amount of the tax. This $0.15 goes to the government. Add the new supply curve incorporating the tax to the graph, and indicate P_B and P_S. Under these circumstances:

    (A) The new equilibrium quantity of Greebes would be _____ million.

    (B) The new equilibrium price paid by buyers would be _____ per Greebe.

    (C) The new equilibrium price received by sellers (after tax) would be _____ per Greebe.

    (D) Buyers would spend a total of _____ million on Greebes.

    (E) Sellers would receive a total of _____ million (after tax) from selling Greebes.

    (F) The government revenue from this tax would be _____ million.

    (G) _____ million of this revenue would be paid by buyers in the form of higher prices.

    (H) _____ million of this revenue would be paid by sellers in the form of reduced income.

    (I) As a result of the tax, buyers will buy a smaller quantity than before the tax. If so, the sellers would also have a loss of revenue that is not collected by the government. In this case, the *uncollected revenue loss* would be equal to _____ million.

Part C

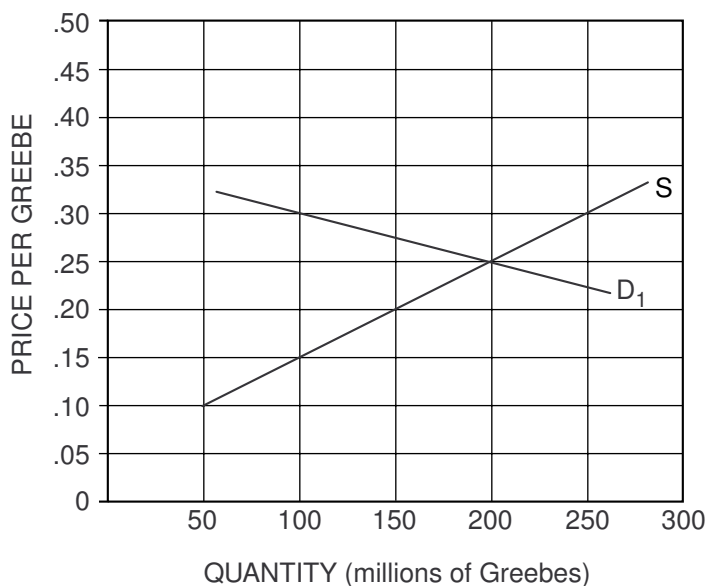✳ Figure 21.5
Perfectly Inelastic Demand for Greebes

11. On Figure 21.5, the equilibrium quantity of Greebes is _____ million.

12. On Figure 21.5, the equilibrium price of Greebes is _____ per Greebe.

13. Buyers are spending a total of _____ million on Greebes.

14. Sellers are receiving a total of _____ million from selling Greebes.

15. If an excise tax of $0.15 for each Greebe sold is levied on the sellers of Greebes, the equilibrium price paid by buyers (P_B) will differ from the equilibrium price received by sellers (P_S) by the amount of the tax. This $0.15 goes to the government. Add the new supply curve incorporating the tax to the graph, and indicate P_B and P_S. Under these circumstances:

   (A) The new equilibrium quantity of Greebes would be _____ million.

   (B) The new equilibrium price paid by buyers would be _____ per Greebe.

   (C) The new equilibrium price received by sellers (after tax) would be _____ per Greebe.

   (D) Buyers would spend a total of _____ million on Greebes.

   (E) Sellers would receive a total of _____ million (after tax) from selling Greebes.

(F) The government revenue from this tax would be _____ million.

(G) _____ million of this revenue would be paid by buyers in the form of higher prices.

(H) _____ million of this revenue would be paid by sellers in the form of reduced income.

(I) As a result of the tax, buyers will buy a smaller quantity than before the tax. If so, the sellers would also have a loss of revenue that is not collected by the government. In this case, the *uncollected revenue loss* would be equal to _____ million.

Part D

✳ Figure 21.6
Perfectly Elastic Demand for Greebes

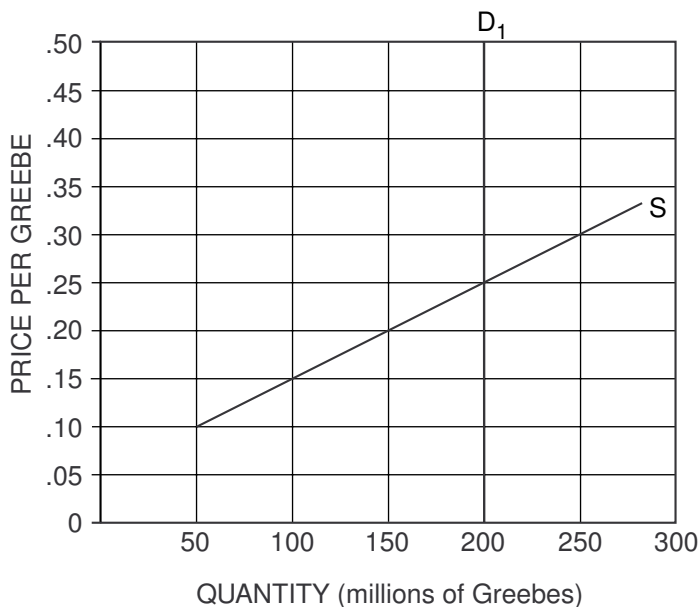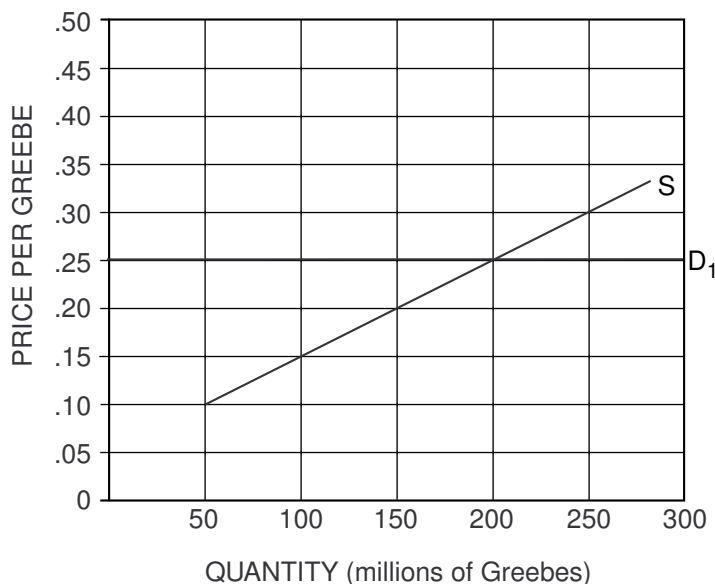16. On Figure 21.6, the equilibrium quantity of Greebes is _____million.

17. On Figure 21.6, the equilibrium price of Greebes is _____ per Greebe.

18. Buyers are spending a total of _____ million on Greebes.

19. Sellers are receiving a total of _____ million from selling Greebes.

20. If an excise tax of $0.15 for each Greebe sold is levied on the sellers of Greebes, the equilibrium price paid by buyers (P_B) will differ from the equilibrium price received by sellers (P_S) by the amount of the tax. This $0.15 goes to the government. Add the new supply curve incorporating the tax to the graph and indicate P_B and P_S. Under these circumstances:

   (A) The new equilibrium quantity of Greebes would be _____ million.

   (B) The new equilibrium price paid by buyers would be _____ per Greebe.

   (C) The new equilibrium price received by sellers (after tax) would be _____ per Greebe.

   (D) Buyers would spend a total of _____ million on Greebes.

   (E) Sellers would receive a total of _____ million (after tax) from selling Greebes.

   (F) The government revenue from this tax would be _____ million.

   (G) _____ million of this revenue would be paid by buyers in the form of higher prices.

   (H) _____ million of this revenue would be paid by sellers in the form of reduced income.

   (I) As a result of the tax, buyers will buy a smaller quantity than before the tax. If so, the sellers would also have a loss of revenue that is not collected by the government. In this case, the *uncollected revenue loss* would be equal to _____ million.

Part E

21. A famous Supreme Court justice once said, "The power to tax is the power to destroy" sellers. This is more likely to be true the more the demand for the product taxed is relatively *(elastic / inelastic).*

22. If you were a government revenue agent interested in getting the most tax revenue possible, you would suggest putting excise taxes on goods whose demand is *(elastic / unit elastic / inelastic).*

23. Think of some real-world goods on which excise taxes are placed: liquor, cigarettes, gasoline. Do you think that the demand for these goods is relatively elastic or relatively inelastic? Why?

Part F

Consider this newspaper quotation and answer the questions that follow: "The city is planning to place a 10 percent tax on auto parking. The tax would fall on every motorist who uses a space in either the garages and the lots operated by the Public Parking Authority or in privately operated lots and garages."

24. Draw the demand curve and the long-run supply curve for parking lots. Explain why each has the shape you show; in other words, why each is relatively elastic or inelastic.

25. Given the curves you have drawn in Question 24, show the effect of introducing a 10 percent tax: How does the equilibrium position after imposition of the tax compare with the initial equilibrium position?

26. The newspaper quotation implies that the "burden" of the tax will fall entirely upon the driver. Is this true for the case you have developed in Questions 24 and 25 above? Under what circumstances would this be true?

Maximum and Minimum Price Controls

Prices send signals and provide incentives to buyers and sellers. When supply or demand changes, market prices adjust, affecting incentives. High prices induce extra production while they discourage consumption.

   In this exercise, we discover how the imposition of price controls (maximum or minimum prices) interrupts the process that matches production with consumption. *Price ceilings* (maximum prices) sometimes appear in the form of rent control, utility prices and other caps on upward price pressure. *Price floors* (minimum prices) also occur in the form of prevailing wages and minimum wages.

   When government imposes price controls, citizens should understand that some people gain and some people lose from every policy change. By understanding the consequences of legal price regulations, citizens are able to weigh the costs and benefits of the change.

   As a general rule, price floors create a *surplus* of goods or services, or *excess supply*, since the quantity demanded of goods is less than the quantity supplied. Conversely, price ceilings generate *excess quantity demanded,* causing shortages.

Figure 22.1
Price Floors and Ceilings
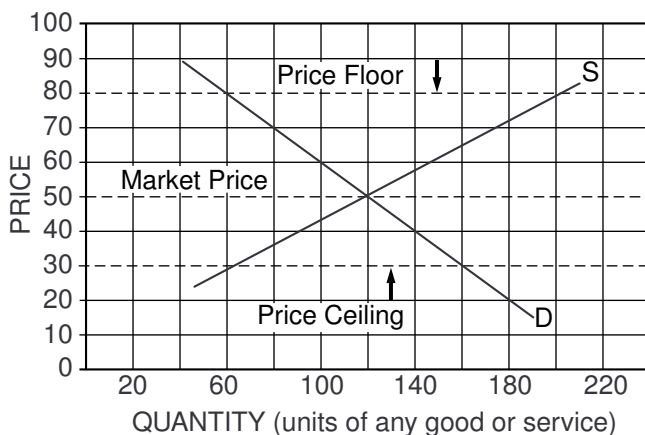
   Price floors and ceilings can be plotted with supply and demand curves. Use Figure 22.1 to answer the questions. Fill in the answer blanks or underline the correct words in parentheses.

1. What is the market price? _____

2. What quantity is demanded and what quantity is supplied at the market price?
    (A) Quantity demanded _____
    (B) Quantity supplied _____

3. What quantity is demanded and what quantity is supplied if the government passes a law requiring the price to be no higher than $30? This is called a *price ceiling*.

(A) Quantity demanded _____

(B) Quantity supplied _____

(C) There is a (*shortage / surplus*) of _____ .

4. What quantity is demanded and what quantity is supplied if the government passes a law requiring the price to be no lower than $80? This is called a *price floor*.

(A) Quantity demanded _____

(B) Quantity supplied _____

(C) There is a (*shortage / surplus*) of _____ .

(D) What happens to total consumer or producer surplus? _____

(E) Is society better or worse off after the price floor is imposed? _____

(F) Who gains from the price floor? _____

Pricing Problems

Write answers to the following questions. Be sure to support your answers with sound economic reasoning and draw graphs where appropriate to illustrate your answers.

1. "Gold is valuable because so many people hunt for it." True, false or uncertain, and why?

2. A consumer group believes the prices of necessities such as food, housing, energy and medical care should be controlled by the government. "People can afford higher prices for luxuries," they reason, "but all of us, and especially the poor, suffer when the prices of necessities rise." Evaluate the effects of this plan.

3. State Representative Smith feels that New York can raise revenue 500 percent by increasing license-plate and registration fees by 500 percent. Will the government increase its revenue by 500 percent? Why or why not?

4. Make the assumption that one day you will be a college graduate. Would you support a law to raise the legal minimum wage of college graduates to $50,000?

Activity written by John Morton, National Council on Economic Education, New York, N.Y.

5. Recently the price of beef rose. Use graphs to show that the increase in price could be consistent with the following. (Be sure to draw a graph and provide a brief explanation for each situation.)

(A) The quantity of beef consumed falls.

(B) The quantity of beef consumed rises.

(C) The quantity of beef consumed stays the same.

6. You stumble across a heated debate in the cafeteria. It seems that a bunch of friends just bought concert tickets from Ticketmeister, a ticket-handling agency, and paid a $4.00 surcharge for each ticket. "It's outrageous! It's not like they actually do anything worth $4.00," complains a friend. Comment on her complaint.

7. You learn that a prominent economist is going to give a lecture, and you rush to get tickets. The economist says, "We economists don't know much, but we know how to create shortages and surpluses."

   (A) How can government create a shortage in a competitive market? Illustrate this with a graph. Can you provide examples of this?

   (B) How can government produce a surplus in a competitive market? Illustrate this with a graph. Can you provide examples of this?

Sample Multiple-Choice Questions

Circle the letter of each correct answer.

1. A downward sloping demand curve can be explained by
   I.   diminishing marginal utility.
   II. diminishing marginal returns.
   III. the substitution effect.
   IV. the income effect.

   (A) I only

   (B) II only

   (C) I and III only

   (D) I and IV only

   (E) I, III and IV only

2. Which of the following will *not* change the demand for oranges?

   (A) A change in consumers' incomes

   (B) A change in the price of grapefruits, a substitute for oranges

   (C) A change in the price of oranges

   (D) A change in consumers' taste for oranges

   (E) An expectation that the price of oranges will increase in the future

3. If there is an increase in demand for a good, what will most likely happen to the price and quantity of the good exchanged?

	Price	Quantity
(A)	No change	No change
(B)	Increase	Increase
(C)	Increase	Decrease
(D)	Decrease	Increase
(E)	Decrease	Decrease

4. If hot dogs are an inferior good, an increase in income will result in

   (A) an increase in the quantity demanded for hot dogs.

   (B) an increase in the demand for hot dogs.

   (C) a decrease in the quantity demanded for hot dogs.

   (D) a decrease in the demand for hot dogs.

   (E) no change in the quantity demanded for hot dogs.

5. An increase in the price of gasoline will cause the demand curve for tires to shift in which direction?

   (A) To the left, because gasoline and tires are substitutes

   (B) To the left, because gasoline and tires are complements

   (C) To the right, because gasoline and tires are substitutes

   (D) To the right, because gasoline and tires are complements

   (E) To the right, because an increase in the price of gasoline makes consumers poorer and thus not willing to pay as much for tires

6. Assume that coal is a normal good. If the price of coal increases and the quantity sold increases, which of the following is consistent with these observations?

   (A) The price of oil increased, oil and coal being substitutes.

   (B) A wage increase was given to coal miners.

   (C) New machinery made coal mining more efficient.

   (D) Consumers' incomes fell.

   (E) The demand curve is inelastic.

7. During a football game, it starts to rain and the temperature drops. The senior class, which runs the concession stand and is studying economics, raises the price of coffee from 50 cents to 75 cents a cup. They sell more than ever before. Which answer explains this?

   (A) The supply of coffee increased.

   (B) The demand curve for coffee was elastic.

   (C) The supply of coffee decreased.

   (D) The demand for coffee increased.

   (E) The demand curve for coffee was inelastic.

8. Which of the following statements best reflects the law of *diminishing marginal utility*?

   (A) "I have to have a scoop of ice cream on my pie."

   (B) "I'll never get tired of your cooking."

   (C) "The last bite tastes just as good as the first."

   (D) "I couldn't eat another doughnut if you paid me."

   (E) "I prefer to eat several small meals a day, rather than three large ones."

9. Which of the following will *not* cause the demand curve for athletic shoes to shift?

   (A) A change in tastes for athletic shoes

   (B) Widespread advertising campaign for athletic shoes

   (C) Increase in money incomes of athletic-shoe consumers

   (D) Expectations that the price of athletic shoes will decrease in the future

   (E) A decrease in the price of athletic shoes

10. Assume that the demand for apples is downward sloping. If the price of apples falls from $.80 per pound to $.65 per pound, which of the following will occur?

    (A) A smaller quantity of apples will be demanded.

    (B) A larger quantity of apples will be demanded.

    (C) Demand for apples will decrease.

    (D) Demand for apples will increase.

    (E) Supply of apples will decrease.
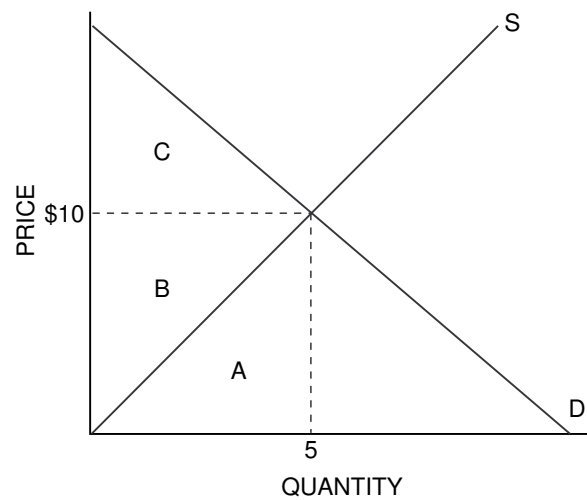
11. On the graph above, what area represents consumer surplus when the price is $10?

    (A) A

    (B) B

    (C) C

    (D) A and B

    (E) B and C

12. If the cost of producing automobiles increases, the price, equilibrium quantity and consumer surplus will most likely change in which of the following ways?

	Price	Quantity	Consumer Surplus
(A)	Increase	Increase	Increase
(B)	Increase	Increase	Decrease
(C)	Increase	Decrease	Decrease
(D)	Decrease	Increase	Decrease
(E)	Decrease	Decrease	Decrease

13. Compare 2000 with 2001. Which of the following statements is (are) true?

Year	Quantity Sold	Price
2000	30,000	$10
2001	50,000	$20

I. Demand has increased.
II. Quantity demanded has increased.
III. Supply has increased.
IV. Quantity supplied has increased.
V. Supply has decreased.

(A) I only

(B) V only

(C) I and IV only

(D) I and V only

(E) I, II and III only

14. Producer surplus is the

(A) area under the supply curve to the left of the amount sold.

(B) area under the supply curve to the right of the amount sold.

(C) amount the seller is paid plus the cost of production.

(D) amount the seller is paid less the cost of production.

(E) cost to sellers of participating in a market.

15. During the 1990s, the price of VCRs fell by about 30 percent, and quantity sold decreased by the same amount. The demand for VCRs must

(A) be inelastic.

(B) be elastic.

(C) be unit elastic.

(D) have shifted to the right.

(E) have shifted to the left.

16. Which of the following will occur if a legal price floor is placed on a good below its free-market equilibrium?

(A) Surpluses will develop.

(B) Shortages will develop.

(C) Underground markets will develop.

(D) The equilibrium price will ration the good.

(E) The quantity sold will increase.

17. A marketing survey shows that gate receipts would increase if the price of tickets to a summer rock concert increased, even though the number of tickets sold would fall. What does this imply about the price elasticity of demand for concert tickets?

(A) Demand is inelastic.

(B) Demand is elastic.

(C) Demand is unit elastic.

(D) Demand is perfectly inelastic.

(E) Demand is perfectly elastic.

QUANTITY OF TICKETS
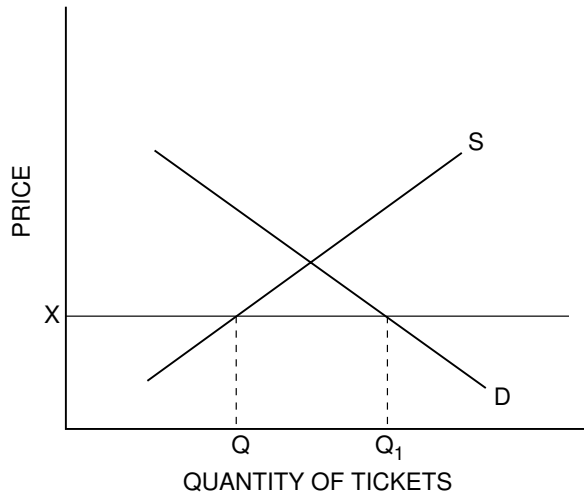
18. According to the graph above, which of the following will occur if a legal price ceiling is imposed at price X?

(A) Shortages will occur.

(B) Surpluses will occur.

(C) Demand will increase.

(D) Q_1 will be purchased.

(E) Supply will decrease.

19. Which of the following statements about price controls is true?

(A) A price ceiling causes a shortage if the ceiling price is above the equilibrium price.

(B) A price floor causes a surplus if the price floor is below the equilibrium price.

(C) A price ceiling causes an increase in demand if the ceiling price is set below the equilibrium price.

(D) A price ceiling causes a decrease in demand if the price floor is set above the equilibrium price.

(E) Price ceilings and price floors result in a misallocation of resources.

20. If the price of lunch at the school cafeteria increases and cafeteria revenue remains constant, the elasticity of demand for a school lunch must be

(A) elastic.

(B) perfectly elastic.

(C) unit elastic.

(D) inelastic.

(E) perfectly inelastic.

21. If an excise tax is imposed on a product, consumer surplus and producer surplus for this good will most likely change in which of the following ways?

	Consumer Surplus	Producer Surplus
(A)	Decrease	Decrease
(B)	Decrease	Increase
(C)	Decrease	Not change
(D)	Not change	Increase
(E)	Not change	Not change

22. If the price of paperback books increases and consumer expenditures on paperback books also increase, which of the following is necessarily true?

(A) Paperback books are normal goods.

(B) Paperback books are inferior goods.

(C) The demand for paperback books is unit elastic.

(D) The demand for paperback books is elastic.

(E) The demand for paperback books is inelastic.

23. The substitution effect causes a consumer to buy less of a product when the price increases because the

(A) product is now less expensive compared to similar products.

(B) product is now more expensive compared to similar products.

(C) consumer's real income has decreased.

(D) consumer's real income has increased.

(E) consumer will buy more inferior goods and fewer normal goods.

Product	% Change in Income	% Change in Quantity
A	+5	+5
B	+5	−5
C	−10	−5
D	−10	+10

24. Based on the information in the table above, which product(s) is/are inferior?

(A) Product A only

(B) Product B only

(C) Product D only

(D) Product A and C only

(E) Product B and D only

25. Brooke is spending all of her income consuming products X and Y. If $MU_x / P_x = 10$ and $MU_y / P_y = 6$, what should Brooke do to maximize her satisfaction?

(A) Buy more X and more Y.

(B) Buy more X and less Y.

(C) Buy less X and less Y.

(D) Buy less X and more Y.

(E) Make no changes.

26. If the price of a good decreases by 3 percent and total revenue increases, the elasticity of demand for the good could possibly be

(A) 1.3

(B) 1

(C) 0.8

(D) 0.2

(E) 0

27. Advocates of higher minimum wages for unskilled labor defend their position by arguing that

(A) low-income workers deserve to earn incomes above the poverty level.

(B) higher wages boost worker productivity and efficiency.

(C) higher wages will cause employers to reduce the payroll, but the total wages of remaining workers will be higher.

(D) higher wages induce more workers into the labor market and thus reduce unemployment.

(E) it is more efficient for the private sector to provide a higher wage than for the government to provide transfer payments to low-income workers.

Sample Short Free-Response Questions

1. Evaluate this statement: "An increase in demand increases price. The higher price increases supply. The higher supply decreases price, and price settles down to the original level."

2. If foreigners demand more American wheat, what will happen to the price and quantity supplied in the momentary situation? In the short run? In the long run? Why?

3. I sit in the back row of the barbers' union where they are discussing a proposal to raise the price of haircuts from $18 to $20. The argument gets nowhere, and someone suggests asking me, as an economist, whether it is a good idea or not. I reply, "Many studies have shown that the demand for haircuts is elastic." What are they to make of this? Why? Be as brief as possible in making the major point that the barbers ought to see in this situation.

4. True, false or uncertain, and explain why? "Other things being the same, the surplus of workers associated with a price floor will be greater the greater the elasticity of both supply and demand." Discuss this statement. Use graphs to illustrate your explanation.
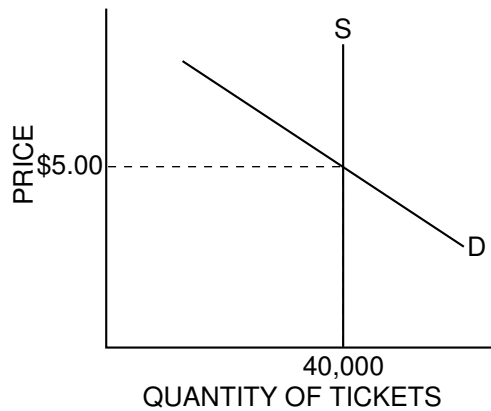
*5. An arena holds a maximum of 40,000 people, as indicated in the graph above. Each year the circus holds eight performances, all of which are sold out.

(A) Analyze the effect on each of the following of the addition of a fantastic new death-defying trapeze act that increases the demand for tickets.

(i) The price of tickets

(ii) The quantity of tickets sold

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(B) The city of Toledo institutes an effective price ceiling on tickets. Explain where the price ceiling would be set. Explain the impact of the ceiling on each of the following:

(i) The quantity of tickets demanded

(ii) The quantity of tickets supplied

(C) Will everyone who attends the circus pay the ceiling price set by the city of Toledo? Why or why not?

6. A newspaper headline says, "The Coldest Winter in 20 Years Brings Record Prices for Heating Oil."

(A) Using a graph of home heating oil, show and explain how price changed.

(B) What other factors could cause the price of heating oil to increase?

7. In a recent year, the price of wheat fell. For each of the following, draw a supply and demand graph showing a decrease in prices with the stated impact on quantity.

(A) The quantity of wheat decreasing

(B) The quantity of wheat increasing

(C) The quantity of wheat staying the same

8. The market for many commodities is seasonal in nature. Their sales (equilibrium quantity) increase dramatically during certain times of the year. Christmas cards and fresh strawberries, at least in the North, are two examples. Christmas-card sales increase during the last three months of the year, and the sales of fresh strawberries in the North increase during the summer months. But the (equilibrium) price movement of these two commodities is quite different during their peak sales season: Christmas cards increase in price during the last three months of the year, whereas strawberries decrease in price during the summer.

(A) Show on the graph below how there can be an increase in the equilibrium quantity and an increase in the equilibrium price of Christmas cards during the last three months of the year, and briefly explain what has happened.

Christmas Card Market
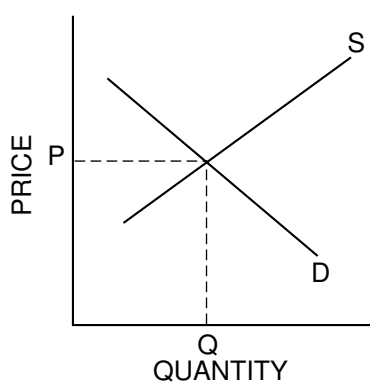
(B) Change the graph for fresh strawberries in the North to show how there can be an increase in the equilibrium quantity and a decrease in the equilibrium price of strawberries in the summer, and briefly explain what has happened.

Strawberry Market in the North
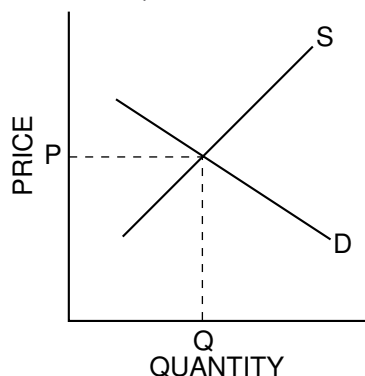
Sample Long Free-Response Questions

1. You are a member of the city council and are considering a law to control rents below the free-market rent. Answer the following questions, and use a graph in your explanation.

   (A) What would be the effect of this rent-control law in the short run? Why?

   (B) What would be the effect of this rent-control law in the long run? Why?

*2. In a perfectly competitive market in long-run equilibrium, what would be the immediate results of imposing and enforcing a price ceiling below the equilibrium price of the product? What would be the long-run effect of continuing to enforce the ceiling price, assuming underground markets don't develop? Be sure to explain why the predicted effects will occur.

---

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*3. Assume the market for unskilled workers is perfectly competitive and in equilibrium. Then a minimum wage is imposed, which increases the wage rate of unskilled workers.

(A) Use supply and demand analysis to explain how this increase in the wage rate will affect each of the following:

(i) The number of workers employed in the market

(ii) The number of unskilled workers seeking employment in the market

(B) Assume that the fast-food industry is perfectly competitive and employs only one factor of production: unskilled workers. Use supply and demand analysis to explain how the increase in the wage rate resulting from the imposition of the minimum wage will affect each of the following in the fast-food industry in the short run.

(i) Price of fast food

(ii) Quantity of fast food produced

---

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■ All firms have costs. It is important to be able to define and plot graphically these major costs.

■ Explicit costs are monetary payments a firm must make to an outsider to obtain a resource.

■ Implicit costs are income a firm sacrifices when it employs a resource it owns to produce a product instead of selling the resource to someone else.

■ Fixed costs do not change with a change in output. There are fixed costs only in the short run. The long run is defined as a period in which there are no fixed costs, and firms are free to allocate their resources as they please.

■ Variable costs change with a change in output. Total costs equal fixed costs plus variable costs. Marginal cost is the additional cost of producing an additional unit of output. Marginal cost is very important in determining at what price and output a firm will operate.

■ Marginal cost eventually rises because of the law of diminishing marginal returns. The law of diminishing marginal returns is based on evidence that marginal product eventually declines when equal amounts of a variable factor of production are added to fixed factors of production.

■ Average total cost and average variable cost are total cost and variable cost divided by output.

■ Average total cost and average variable cost fall when marginal cost is below them and rise when marginal cost is above them.

■ The marginal cost curve crosses the average variable cost curve and the average total cost curve at their lowest points.

■ If a firm has revenue that just covers all its costs, it breaks even.

■ If a firm has more revenue than costs, it makes an economic profit.

■ If a firm has more costs than revenue, it operates at an economic loss.

■ In the long run, a firm must cover all its implicit and explicit costs, including a normal rate of profit.

■ A normal profit represents the opportunity cost of capital and is equal to the average return on investment.

■ In the short run, a firm can operate at a loss as long as its revenue covers its variable costs.

■ Economic profits are profits over and above the normal rate of profit at which a firm just covers its costs. A firm makes an accounting profit when its revenue exceeds its explicit costs.

■ A firm makes an economic profit if it more than covers both its explicit and implicit costs.

■ The objective of a firm is to maximize profits and/or minimize loss.

■ Firms maximize profits when they produce where marginal revenue equals marginal cost.

■ Perfect competition exists when there are many producers and many consumers of a homogeneous product.

■ For a perfectly competitive firm, marginal revenue is equal to price. A perfectly competitive firm produces where price equals marginal cost. A perfectly competitive firm breaks even in the long run.

■ A monopoly occurs when one firm controls the market.

■ Other things being constant, the most efficient allocation of resources occurs when a firm produces at the level of output where price (measuring marginal benefits to buyers) is equal to marginal cost.

- In the long run, a perfectly competitive firm produces at an output where price equals marginal cost and also produces where average total cost reaches its lowest point. A perfectly competitive firm is allocatively and productively efficient in the long run.

- Allocatively efficient means the perfectly competitive firm operates at the point where P = MC. Productive efficiency means the perfectly competitive firm operates at the point where P = MC = minimum ATC in the long run.

- For a monopoly firm or any firm under imperfect competition, marginal revenue is less than price.

- A monopoly firm maximizes profits by producing at the quantity where marginal revenue equals marginal cost and by setting

price according to the demand curve at that quantity.

- A monopoly firm can make economic profits in the long run. However, a long-run economic profit is not guaranteed.

- In the long run, a monopoly firm charges a higher price and produces at a lower output than a perfectly competitive firm with the same cost curves.

- A monopoly firm will operate where price is greater than marginal cost, causing a misallocation of resources.

- Oligopoly occurs when a few firms control the market.

- Monopolistic competition is close to pure or perfect competition except that there is product differentiation.

Different Types of Market Structures

After you have learned about the four types of market structures, complete Figure 24.1.

✳ Figure 24.1
Market Structures

Characteristics

Market Structure	Number of Firms	Differentiated or Homogeneous Product	Ease of Entry
Perfect Competition			
Monopolistic Competition			
Oligopoly			
Monopoly			

Results

Market Structure	Price-Setting Power	Nonprice Competition	Allocative and Productive Efficiency	Long-Run Profits	Examples
Perfect Competition					
Monopolistic Competition					
Oligopoly					
Monopoly					

Mirror Images: Marginal Product and Marginal Cost

Most of the activities in this unit concern costs. You will be concerned with *fixed costs, variable costs, total costs, average costs* and, most importantly, *marginal costs.* These economic costs are the *costs of production.* In the final analysis, these costs are opportunity costs and involve forgoing the opportunity to produce alternative goods and services. These costs depend on how efficient the production process is. The efficiency of the production process is affected by the *law of diminishing marginal returns.* This activity shows how the law of diminishing marginal returns affects production and how changes in productive efficiency affect costs.

Part A

The Law of Diminishing Marginal Returns

Use the data from Figure 25.1 to plot total product at various quantities of labor on Figure 25.2. Then use the data from Figure 25.1 to plot marginal product and average product at various quantities of labor on Figure 25.3 (plot the marginal between the points). The first two points are plotted for you. Now answer questions 1 through 9.

✳ Figure 25.1
The Law of Diminishing Marginal Returns

(1) Inputs of the Variable Resource (labor)	(2) Total Product	(3) Marginal Product Δ2 / Δ1	(4) Average Product (2) / (1)
0	0		
1	10	10	10
2	25	15	$12^{1}/_{2}$
3	37	12	$12^{1}/_{3}$
4	47	10	$11^{3}/_{4}$
5	55	8	11
6	60	5	10
7	63	3	9
8	63	0	$7^{7}/_{8}$
9	62	−1	$6^{8}/_{9}$

Source: Campbell McConnell and Stanley Brue, *Economics,* 13th ed., 1996.

Activity written by John Morton, National Council on Economic Education, New York, N.Y.

✳ Figure 25.2
The Law of Diminishing Marginal Returns
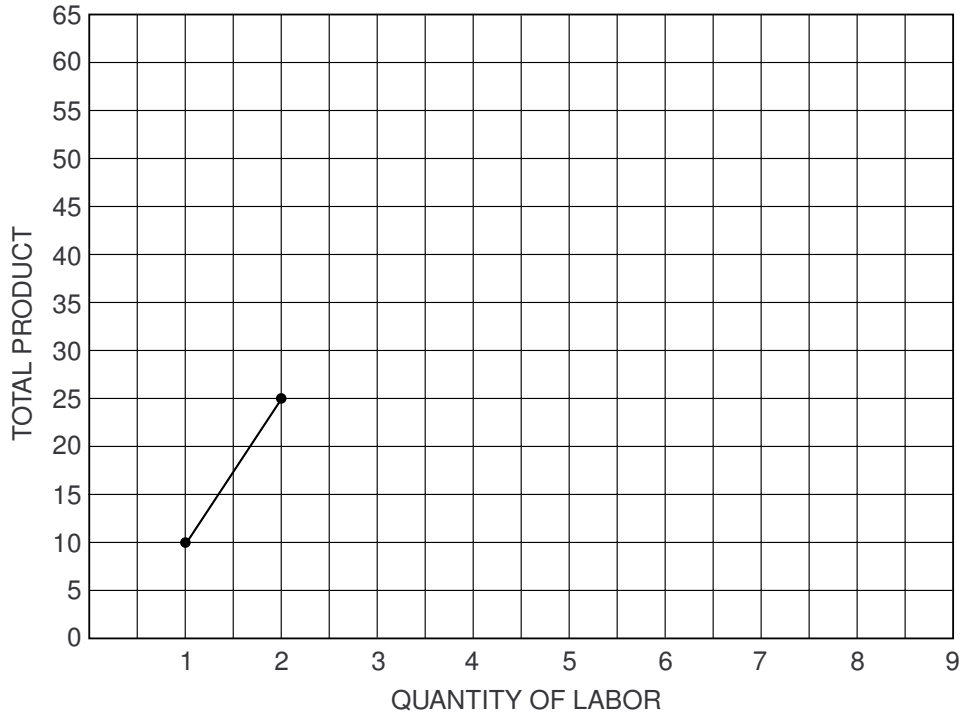
✳ Figure 25.3
Marginal and Average Product
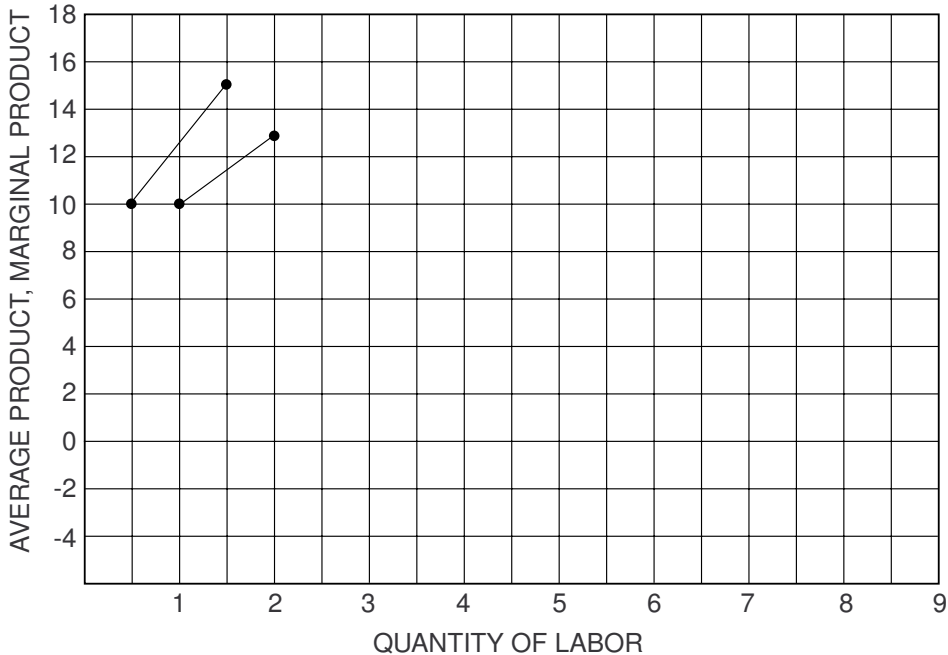
1. What happens to the total product curve as output (production) increases?

2. What happens to the marginal product curve as output increases?

3. What happens to the average product curve as output increases?

4. Where does the marginal product curve cross the average product curve?

5. Why do these curves look the way they do?

6. What is the law of diminishing marginal returns?

7. Why is this concept important?

8. What is the relationship between marginal product and total product?

9. What is the relationship between marginal product and average product?

Part B

Products and Costs: A Mirror View

Now look at Figure 25.4, which relates marginal and average product to marginal and average variable costs. Then answer the questions that follow the graph. (*Variable costs* are costs that change with the level of output. *Average variable costs* are total variable costs divided by output.)

✳ Figure 25.4
Marginal Product and Marginal Cost
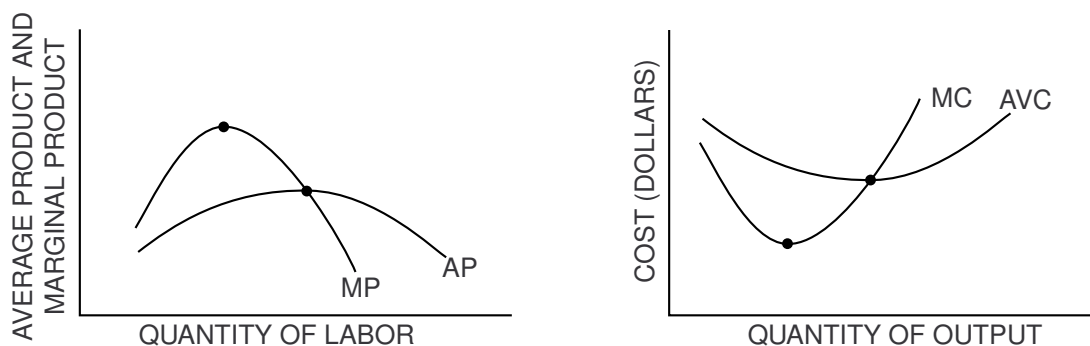
10. Where does marginal product cross average product?

11. Where does marginal cost cross average variable cost?

12. Will this always be true? Why or why not?

13. How does the law of diminishing marginal returns affect output (product) and costs?

Costs of the Individual Firm

Part A

Fill in the blanks and answer the questions.

1. M.I. Fortunate was employed as plant manager for a corporation at a salary of $50,000 a year, and she had savings of $100,000 invested in securities that yielded an 8 percent annual income. She went into business for herself, investing all her savings in the enterprise. At the end of the first year, her accounts showed a net income of $55,000 after all expenses of operation. One accountant said this accounting profit represented a 55 percent return on her $100,000 investment. Another accountant, who had taken introductory microeconomics, said, "No, you should pay yourself the $50,000 salary you would have earned anyway, and your accounting profit of $5,000 represents a return of 5 percent on your investment of $100,000." A serious student of introductory microeconomics, however, should say, "No, your true economic profit from going into business for yourself is _____, and this is a return of _____ percent." Was M.I. Fortunate fortunate? Why or why not?

2. Figure 26.1 (on the next page) shows a comprehensive set of cost data for a firm with a given plant at various levels of output. Study this table to understand how it is set up.

    Marginal cost is the *additional* cost of producing an *additional* unit of output (ΔTC / ΔQ). If producing an additional 100 units of output adds $700 to total cost, the marginal cost per unit is $700 / 100 = $7.00, etc. Note that in the table, the "marginal" changes are located between output levels.

    After you have filled in the blanks in Figure 26.1, finish plotting the aggregate cost data for fixed cost, variable cost and total cost *(not* change in total cost) on Figure 26.2. Also, finish plotting the unit cost data for FC / Q, VC / Q, TC / Q and ΔTC / ΔQ on Figure 26.3. Note that marginal cost (ΔTC / ΔQ) is plotted at the midpoint (between output levels).

3. After you have finished plotting, answer the eight questions in Part B.

✳ Figure 26.1

Aggregate and Unit Cost Structure

	Aggregate Cost Data				Unit Cost Data		
Output	Total Fixed Cost	Total Variable Cost	Total Cost	Marginal Cost ($\Delta TC / \Delta Q$)	Average Fixed Cost	Average Variable Cost	Average Total Cost
0	$500	$0	$500				
100	500	700	1,200	$7.00	$5.00	$7.00	$12.00
200	500	1,300		6.00	2.50	6.50	9.00
300			2,300	5.00	1.67	6.00	
400		2,400		6.00	1.25	6.00	7.25
500	500	3,100	3,600	7.00	1.00	6.20	
600	500		4,320	7.20	0.83	6.37	7.20
700	500	4,700	5,200	8.80	0.71	6.71	7.42

✳ Figure 26.2

Graph of Aggregate Cost Data
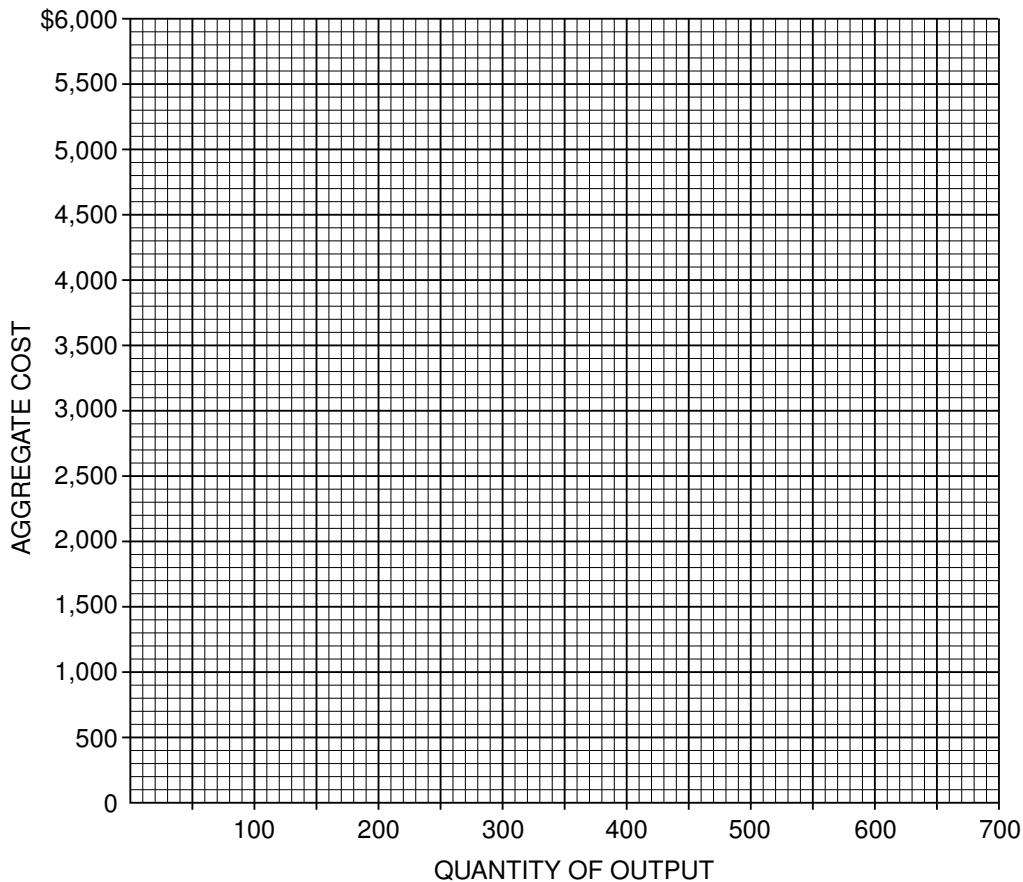
✳ Figure 26.3

Graph of Unit Cost Data

Note: Marginal cost (ΔTC / ΔQ) is plotted between the output levels shown in Figure 26.1.
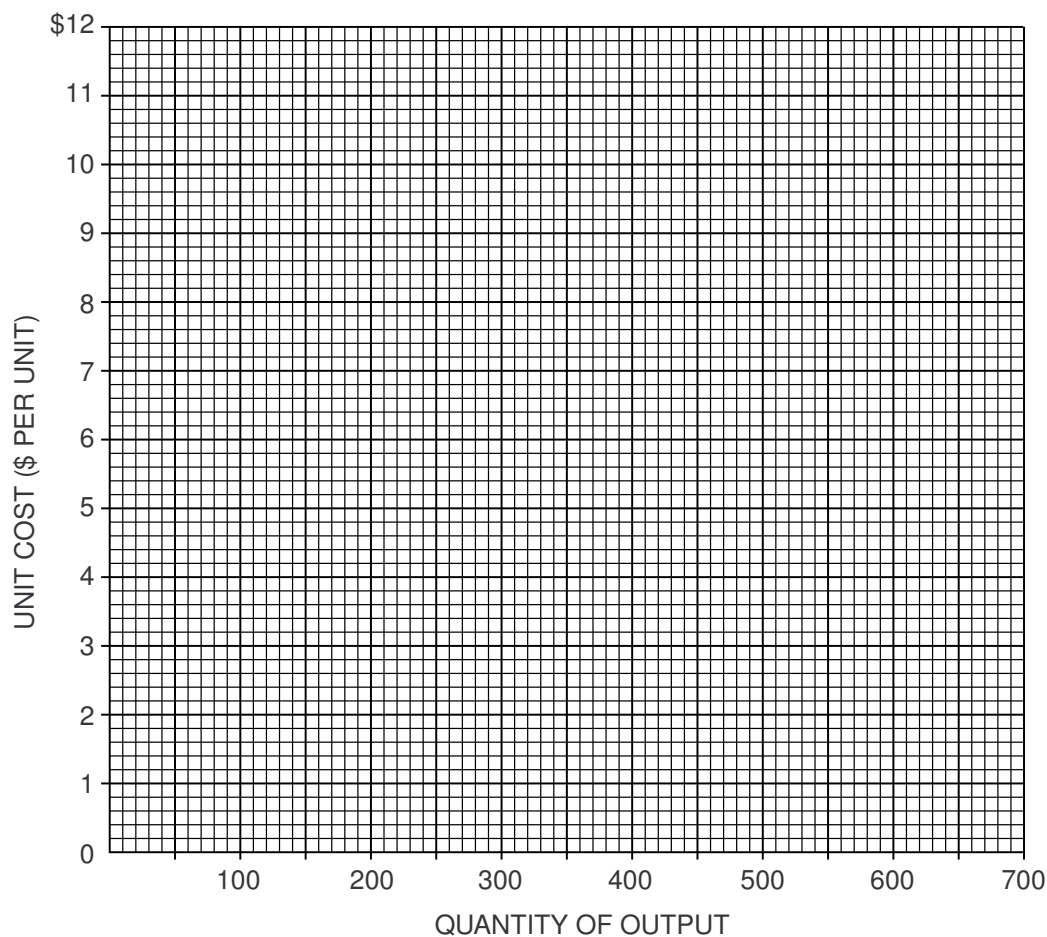
Part B

4. How is marginal cost (ΔTC / ΔQ) represented in Figure 26.2?

5. On Figure 26.3, total cost per unit (TC / Q or average total cost) is at a minimum at an output level of _____ units.

6. On Figure 26.3, variable cost per unit (VC / Q or average variable cost) is at a minimum at an output level of _____ units.

7. On Figure 26.3, what is the relation between marginal cost (ΔTC / ΔQ) and average total cost (TC / Q) when average total cost is at its minimum?

8. On Figure 26.3, what is the relation between marginal cost (ΔTC / ΔQ) and average variable cost (VC / Q) when average variable cost is at its minimum?

9. Explain why marginal cost on a unit-cost graph always intersects average total cost and average variable cost at their minimum points.

10. On Figure 26.3, what does the vertical distance between the TC / Q curve and VC / Q curve represent?

11. Explain why fixed cost has no influence on marginal cost.

An Introduction to Perfect Competition

This activity explains how businesses operate and how their operation affects society. To accomplish this explanation, it is necessary to look at business costs and revenue. This analysis is based on the assumption that the goal of any business is to maximize profits.

Part A

Fill in the blanks in Figure 27.1. Graph the marginal cost data from Figure 27.1 on Figure 27.2 and then answer the questions. MC is on the vertical axis, and output of yo-yos is on the horizontal axis. Plot MC on the midpoint.

✳ Figure 27.1
Output, Total Cost and Marginal Cost

Output	Total Cost (TC)	Marginal Cost (MC)
0	$55	
1	85	
2	110	
3	130	
4	160	
5	210	

✳ Figure 27.2
Plotting Marginal Cost of Yo-Yos
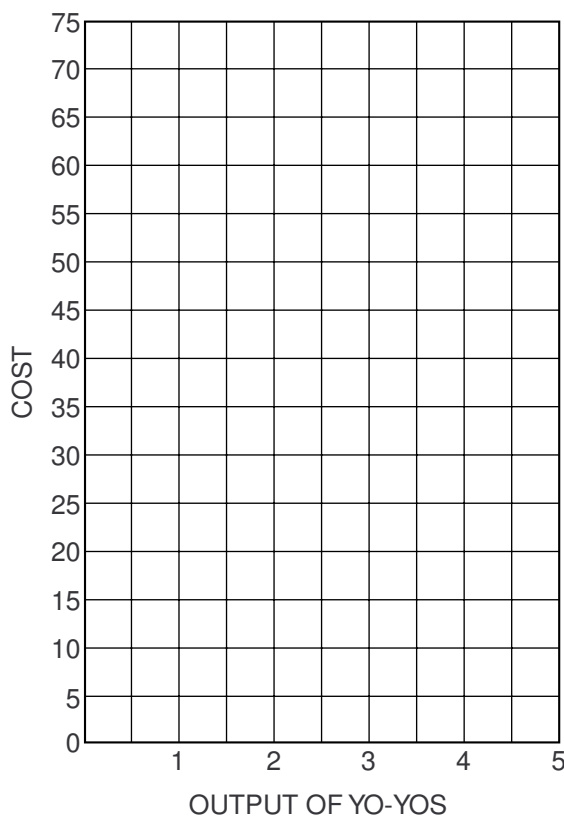
1. What is the relationship between MC and output as shown on your graph?

2. Explain why MC falls and then rises as output increases.

Part B

Complete Figure 27.3. Assume that the firm has a total fixed cost (FC) of $100 and total variable costs (VC) as shown below. Part of the table has been completed for you.

✳ Figure 27.3

Fixed and Variable Costs of Yo-Yos

Total Product	Fixed Cost	Variable Cost	Total Cost	Marginal Cost	Average Fixed Cost	Average Variable Cost	Average Total Cost
0	$100.00	$0	$100.00				
1	100.00	10.00	110.00	$10.00	$100.00	$10.00	$110.00
2	100.00	16.00	116.00	6.00	50.00	8.00	58.00
3	100.00	21.00					
4		26.00					
5		30.00					
6		36.00					
7		45.50					
8		56.00					
9		72.00					
10		90.00					
11	100.00	109.00					
12	100.00	130.00					
13	100.00	160.00					

3. Graph FC, VC and TC on Figure 27.4. Label each curve. Then answer the questions.

   (A) What is the difference between fixed and total costs?

   (B) Why does VC rise as output increases?

   (C) Why is FC a horizontal line?

   (D) Why does the TC curve have the same slope as the VC curve?

✳ Figure 27.4

Total Fixed Costs, Total Variable Costs and Total Costs
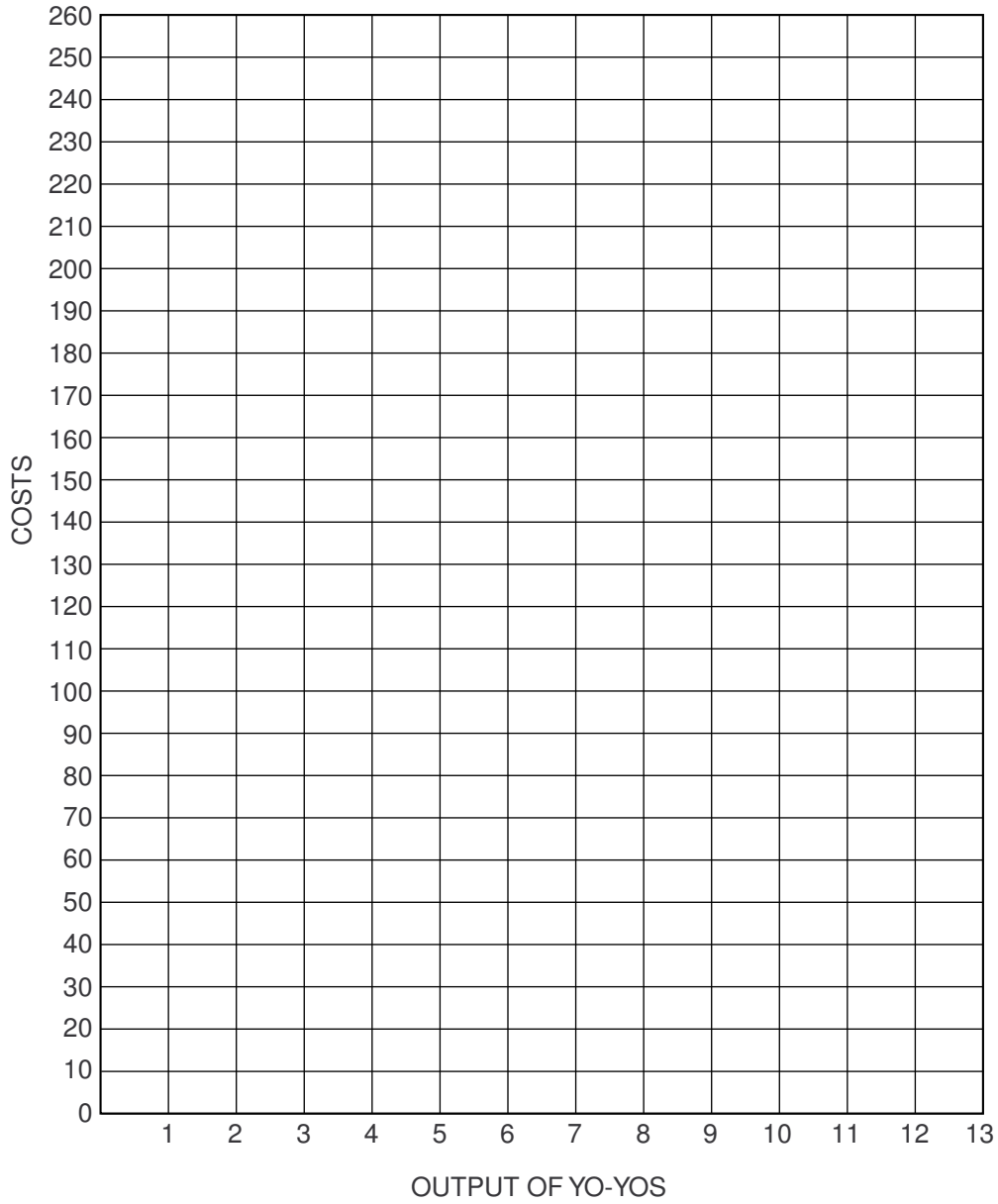
✳ Figure 27.5

Average Variable, Average Fixed, Average Total and Marginal Costs

OUTPUT OF YO-YOS
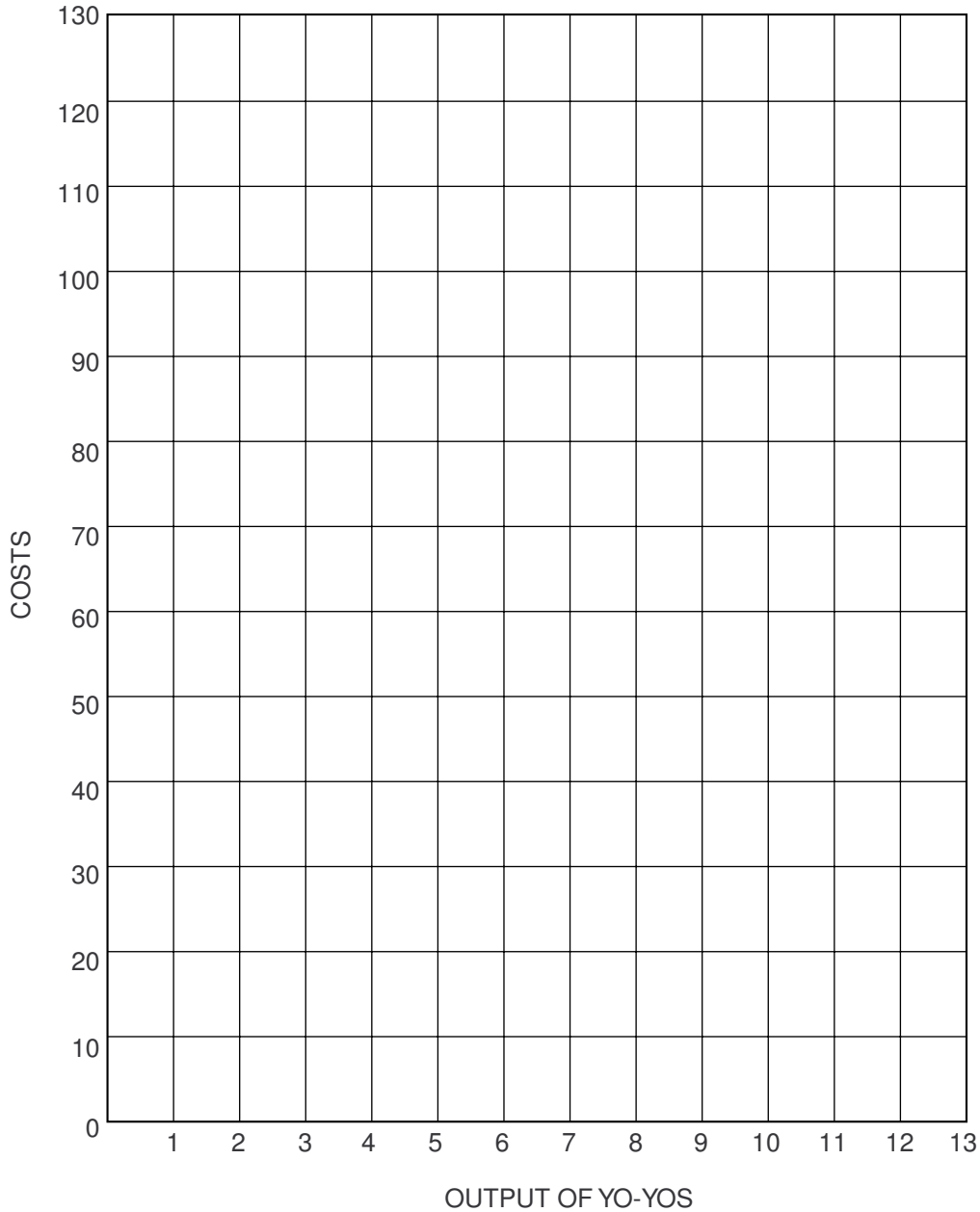
4. Graph AFC, AVC, ATC and MC on Figure 27.5 (be sure to plot MC on the midpoints of output). Label each cost curve. Then answer the questions.

(A) What happens to AFC as output rises? Why?

(B) What happens to AVC as output rises? Why?

(C) What happens to ATC as output rises? Why?

(D) What happens to MC as output rises? Why?

(E) At what unique point does marginal cost cross AVC and ATC? Why?

(F) Why is MC the same whether computed from TC or VC?

Part C

For firms operating under perfect competition define the following terms.

5. Total revenue (TR)

6. Marginal revenue (MR)

7. Average revenue (AR)

Part D

Figure 27.6 is a revenue schedule for a perfectly competitive firm. Fill in the blanks.

✳ Figure 27.6

Revenue Schedule for a Perfectly Competitive Firm

Price	Quantity	TR	MR
$10	1	$10	
10	2	20	$10
10	3	30	
10	4		

8. What generalization can you make about price and marginal revenue under perfect competition?

9. Why doesn't the perfect competitor lower the price to sell more?

10. What determines the price at which the perfect competitor sells the product?

Part E

11. Graph prices of $5.00, $10.50 and $21.50 on Figure 27.5. (Hint: Each price is a horizontal line.)

12. At a price of $21.50:

    (A) How many yo-yos will the firm produce in the short run? Why? (Note: Assume you can pro-
        duce part of a yo-yo.)

    (B) Will the firm earn an economic profit or have an economic loss?

    (C) How much will the approximate profit or loss be per unit?

    (D) How much will the approximate total profit or loss be?

13. At a price of $10.50:

    (A) How many yo-yos will the firm produce in the short run? Why?

    (B) Will the firm earn an economic profit or have an economic loss?

    (C) How much will the approximate profit or loss be per unit?

    (D) How much will the approximate total profit or loss be?

    (E) Will this yo-yo firm stay open or shut down in the short run? Why?

14. At a price of $5.00:

    (A) How many yo-yos will this firm produce in the short run? Why?

    (B) Will this firm stay open or shut down in the short run? Why?

15. Why will a firm maximize its profits or minimize its losses at the output where MR (price) equals MC?

16. Why are price and MR the same for a perfect competitor?

17. Why is a perfect competitor called a *price taker*?

Costs and Competitive Market Supply (Perfect Competition)

Part A

1. The Fiasco Company is a perfectly competitive firm whose daily costs of production (including a "normal" rate of profit) in the short run are as follows:

Figure 28.1
The Fiasco Company's Cost Table

Output (per day)	Total Variable Cost	Total Cost	Marginal Cost	Average Total Cost	Average Variable Cost
0	$0	$12.00			
1	4.00	16.00	$4.00	$16.00	$4.00
2	7.00	19.00	3.00	9.50	3.50
3	9.00	21.00		7.00	3.00
4	12.00	24.00			
5	18.00				
6	27.00				
7	37.00				
8	49.00				
9	63.00				
10	79.00				

(A) Fill in the blanks in Figure 28.1.

(B) On Figure 28.2, plot and label the average variable cost (AVC), average total cost (ATC) and marginal cost (MC) curves. Plot marginal cost at the midpoint. Assume this firm can produce any fraction of output per day so that you connect the points to form continuous curves.

Adapted from Phillip Saunders, *Introduction to Microeconomics: Student Workbook,* 18th ed. (Bloomington, Ind., 1998). Copyright © 1998 Phillip Saunders. All rights reserved.

✳ Figure 28.2
The Fiasco Company's Cost Curves
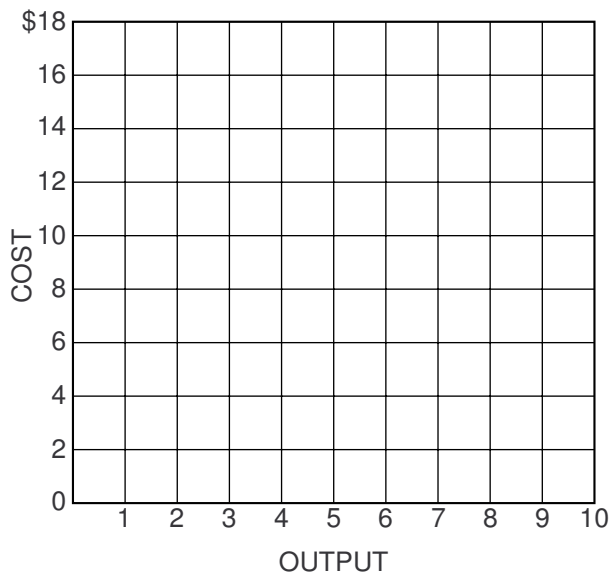
(C) How would you interpret the vertical distance between the average total cost and average variable cost curves?

(D) Why does average total cost decline at first, then start rising as output is increased?

(E) The marginal cost curve intersects both average cost curves (ATC and AVC) at their minimum points. Why?

(F) If fixed costs were $20 instead of $12, how would the change affect average variable costs and marginal costs?

2. Given the cost curves for Fiasco Company on Figure 28.2 and the fact that the competitive market price at which the company must sell its output is $11 a unit, fill in the blanks below and add to your graph in Figure 28.2. (Remember, fractions of units are allowed.)

(A) Draw and label the average and marginal revenue curves on your graph.

(B) In order to maximize profits, Fiasco would sell _____ units, at a price of _____. Its average total cost would be _____. Its average revenue would be _____. It would earn a per-unit profit of _____ and total profit of _____ per day.

(C) If the firm produced instead at the quantity that minimized its average total cost, it could sell _____ units, at a price of _____. Its average total cost would be _____. If the market price were $11, its average revenue would be _____. It would earn a per-unit profit of _____ and total profit of _____ per day.

(D) If the competitive market price fell to $5 a unit, Fiasco would sell _____ units. Average total cost would be _____. It would earn a per-unit *(profit / loss)* of _____ and a total *(profit / loss)* of _____ per day.

Part B

3. The long-run cost conditions, including a "normal" rate of profit, for a perfectly competitive firm are as follows:

✳ Figure 28.3

A Perfectly Competitive Firm Earning a "Normal" Rate of Profit

Output	Total Cost	Marginal Cost	Average Total Cost
1	$9.00		$9.00
2	13.00	$4.00	6.50
3	18.00	5.00	
4	24.00	6.00	
5	31.00		6.20
6	39.00		
7	48.00		6.86
8	58.00		
9	69.00		7.67
10	81.00		8.10

(A) Fill in the blanks in the average total cost and marginal cost columns.

(B) The level of output at which average total cost is at a minimum is _____ units. At this output, average total cost is $_____.

(C) What quantities would the firm be willing to supply at each of the following prices for its product?

✳ Figure 28.4
Price and Quantity Supplied

Price	Quantity Supplied
$6	4
7	5
8	
9	
10	
11	
12	

(D) In general, the supply schedule (curve) of a perfectly competitive firm coincides with its _____ schedule (curve) in the range where _____ is greater than _____.

4. Suppose the perfectly competitive firm in Question 3 is one of 1,000 identical firms currently operating in a competitive industry, all of which have identical cost functions. The market demand for this industry is given in Figure 28.5

✳ Figure 28.5
Market Demand for an Industry

Price	Quantity Demanded	Quantity Supplied
$12	2,000	10,000
11	3,000	9,000
10	4,000	
9	5,000	
8	6,000	
7	7,000	
6	8,000	

(A) Fill in the industry supply schedule in Figure 28.5. Then answer the following questions by filling in the answer blanks, underlining the correct words in parentheses or writing a sentence.

(B) Explain briefly how the short-run supply schedule (curve) of a competitive industry is derived.

(C) Given the present 1,000 firms in the industry, the present market price is _____; the present equilibrium quantity is _____ units. At this price, each firm will be making *(positive economic profit / zero economic profit / negative economic profit / economic losses)*.

(D) Given the equilibrium above, and assuming that other firms can enter the industry with the same cost as the present firms, the number of firms in the industry in the long run will tend to *(increase / decrease/ remain constant)* and the price will tend to *(increase / decrease / remain constant)*. The output of the industry will tend to *(increase / decrease / remain constant)*, while output per firm will *(increase / decrease/ remain constant)*.

(E) If this is a constant-cost industry (i.e., costs per unit of output are constant as the industry expands), the long-run equilibrium price for the industry will be _____; output per firm will be _____ units. There will be _____ firms in the industry, each earning _____ economic profits; industry output will be _____ units. The equilibrium price coincides with the _____ per-unit cost of production.

(F) Can you see why, under the conditions described above, that the long-run market-supply curve for this industry would appear as a horizontal line on a graph? Explain.

(G) Using the cost curves in Figure 28.2, at what price would this long-run horizontal line be plotted? _____ Explain why it would be at this price.

Short-Run and Long-Run Competitive Equilibrium

Part A

✳ Figure 29.1
Competitive Firm and Industry

**Diagram A: Cost Situation
for Each Greebe Producer**
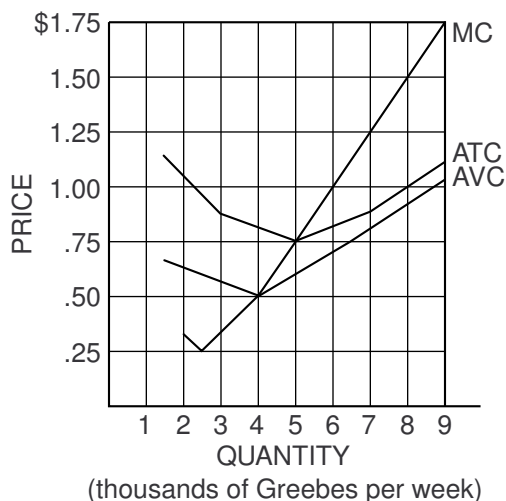
**Diagram B: Market Supply
and Demand for Greebes**

Diagram A y-axis: PRICE — $1.75, 1.50, 1.25, 1.00, .75, .50, .25; labels MC, ATC, AVC. x-axis: QUANTITY 1 2 3 4 5 6 7 8 9 (thousands of Greebes per week)

Diagram B y-axis: PRICE — $1.75, 1.50, 1.25, 1.00, .75, .50, .25; label D. x-axis: QUANTITY 1 2 3 4 5 6 7 8 9 (millions of Greebes per week)
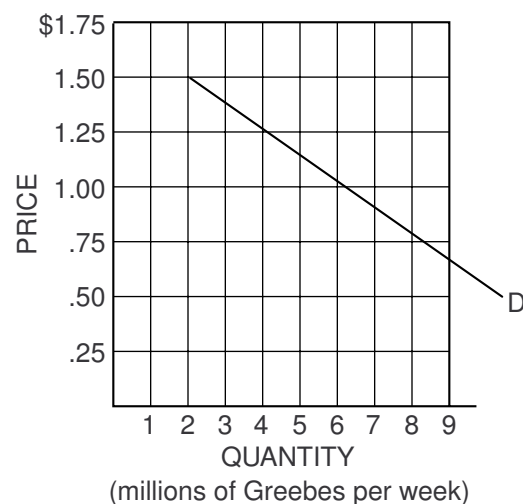
There are currently 1,000 producers of Greebes, each with economic costs like those shown in Diagram A of Figure 29.1. (You should know how to label each of the cost curves.) The market demand for Greebes is shown in Diagram B of Figure 29.1. Assume that the minimum of the short-run average total cost curve occurs at the same output as the minimum of the long-run average total cost curve.

1. Plot on Diagram B the current market supply curve for Greebes and label this curve S. (Ask how much each producer will supply at various prices, and figure how much the total supply *from all 1,000 producers together* will be at those prices. **Note:** One million is a thousand thousand: 1,000,000.)

2. Shade in the appropriate profit (or loss) rectangle in Diagram A, and calculate the total amount of economic profit or loss each typical Greebe producer will make under these conditions. Fill in the blanks below to aid you in your calculations.

    (A) Price (P) received by each Greebe producer: _____ per Greebe

(B) Quantity (Q) produced by each Greebe producer: _____ thousand Greebes per week

(C) Average total cost (ATC) for this quantity (approximate): _____ per Greebe

(D) Economic profit (loss) for each unit produced (P–ATC): _____ per Greebe

(E) Total economic profit (loss) for each Greebe producer: Profit (loss) per unit x quantity
produced = _____ per week

3. Is the Greebe market in long-run equilibrium? Why or why not?

4. What is the long-run equilibrium price in this market? _____ per Greebe

(A) How many Greebes will each firm produce at this price? _____ thousand Greebes per week

(B) What will be the total market quantity of Greebes produced at this price?
_____ million Greebes per week

(C) How many firms will be in the market at this price? _____

Part B

✳ Figure 29.2
Competitive Firm and Industry

**Diagram C: New Cost Situation
for Each Greebe Producer**
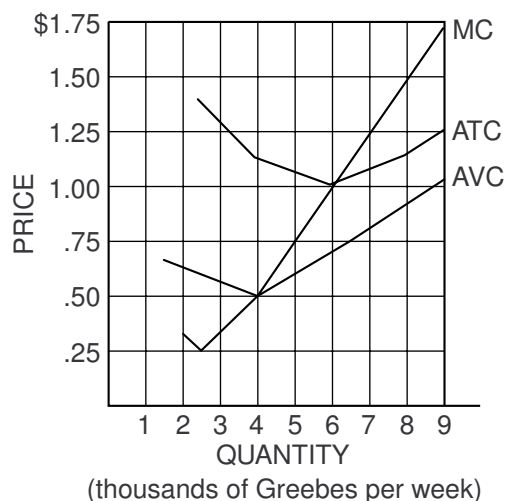
**Diagram D: New Market Supply
and Demand for Greebes**
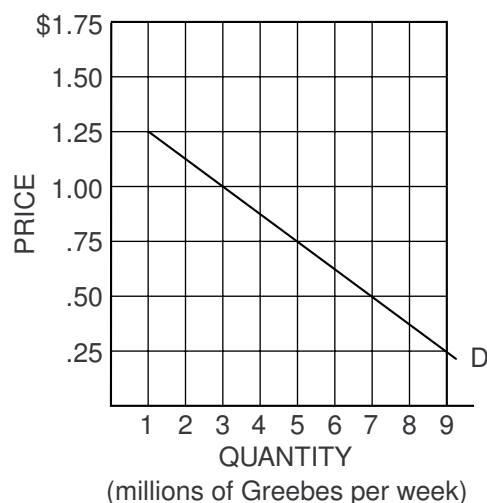
Now, let's start all over again with a new set of cost and demand conditions in the Greebe market. There are again currently 1,000 producers of Greebes, each with economic costs like those shown in Diagram C of Figure 29.2. The market demand for Greebes is shown in Diagram D.

5. Plot on Diagram D the current market supply curve for Greebes and label this curve S.

6. Shade in the appropriate profit (or loss) rectangle in Diagram C, and calculate the total amount of economic profit or loss that each typical Greebe producer will make under these conditions. Fill in the blanks below to aid you in your calculations.

    (A) Price (P) received by each Greebe producer: _____ per Greebe

    (B) Quantity (Q) produced by each Greebe producer: _____ thousand Greebes per week

    (C) Average total cost (ATC) for this quantity (approximate): _____ per Greebe

    (D) Economic profit (loss) for each unit produced (P – ATC): _____per Greebe

    (E) Total economic profit (loss) for each Greebe producer: Profit (loss) per unit x quantity produced = _____ per week

7. Is the Greebe market in long-run equilibrium? Why or why not?

8. What is the long-run equilibrium price in this market? _____ per Greebe

    (A) How many Greebes will each firm produce at this price? _____ thousand Greebes per week

    (B) What will be the total market quantities of Greebes produced at this price? _____ million Greebes per week

   (C) How many firms will be in the market at this price? _____

Long-Run Average Cost Curves

The cost curves that we used in previous activities are short-run cost curves. In the short run, firms can vary output but not plant capacity. Here, we turn to the long run, defined as a time period in which the firm can vary its plant capacity and its output. In the short run, the shapes of the average and marginal cost curves result from diminishing marginal productivity of the resources. In the long run, the shape of the average cost curve results from economies and diseconomies of scale. Sources of economies of scale are specialization of resources, more efficient uses of equipment, a reduction in per-unit costs of factor inputs, an effective use of production by-products and an increase in shared facilities. Sources of diseconomies of scale are limitations on management decision making and competition for factor inputs.

Part A

Use Figure 30.1 to answer the following questions.

✳ Figure 30.1
Long-Run Average Total Cost Curves
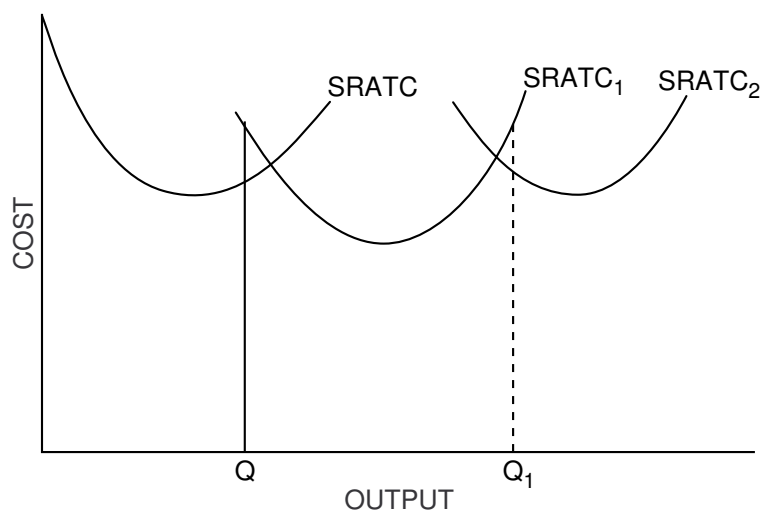
1. What does each of the short-run ATC curves represent?

2. The firm can minimize costs by producing output level Q using firm size _____. This means that it would be *(underutilizing / overutilizing)* plant size (*SRATC / SRATC$_1$*).

3. Label the optimal output level in the diagram as Q$_{LR}$.

Activity written by Rae Jean B. Goodman, U.S. Naval Academy, Annapolis, Md.

4. To produce output level Q_1, the firm should use plant size _____. This means that it would be *(underutilizing / overutilizing)* plant size *(SRATC$_1$ / SRATC$_2$)*.

5. Draw in the long-run average total cost curve and indicate its tangency points with each short-run ATC curve. Label the curve LRATC.

6. The firm experiences *(economies / diseconomies)* of scale up to output level _____ and *(economies / diseconomies)* of scale beyond output level _____.

Part B

7. In the space below, draw the long-run average total cost curve for a firm experiencing constant returns to scale. Explain your diagram. Give an example of a type of firm that experiences constant returns to scale.

8. In the space below, draw the long-run average total cost curve for a firm experiencing decreasing returns to scale. Explain your diagram. Give an example of a type of firm that experiences decreasing returns to scale.

9. In the space below, draw the long-run average total cost curve for a firm experiencing increasing returns to scale. Explain your diagram. Give an example of a type of firm that experiences increasing returns to scale.

Part C
Indicate whether you think the following statements are true, false or uncertain. Explain why.

10. In the long run, a cost-minimizing firm will overutilize its plant when it produces at an output level greater than the optimal level.

11. The short-run average total cost curve declines and then increases as a factor input increases because of economies and diseconomies of scale.

Graphing Perfect Competition

The following firms or industries are all operating in a perfectly competitive market.

(A) Illustrate each situation on the graph provided.

(B) Label all curves in your answers.

(C) Explain the reasoning for your graphs in each situation.

1. A firm experiencing economic profit in the short run.

✳ Figure 31.1

Short-Run Economic Profit
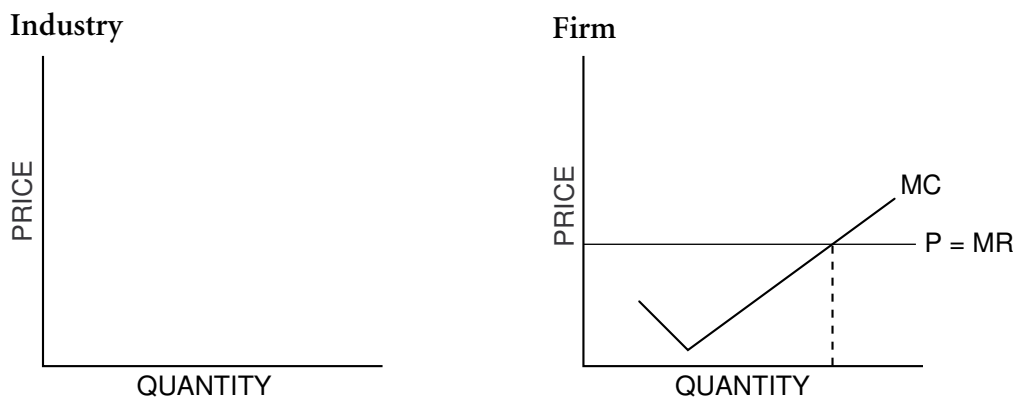
Industry

Firm

Explanation:

2. A firm operating with an economic loss in the short run.

✳ Figure 31.2
Short-Run Economic Loss
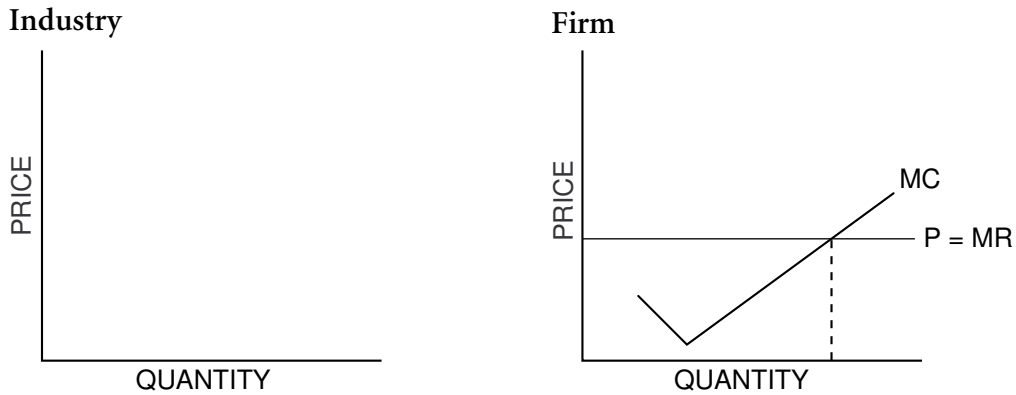
Industry

Firm

Explanation:

3. A firm in a classic shutdown position in the short run.

✳ Figure 31.3
Classic Shutdown Position
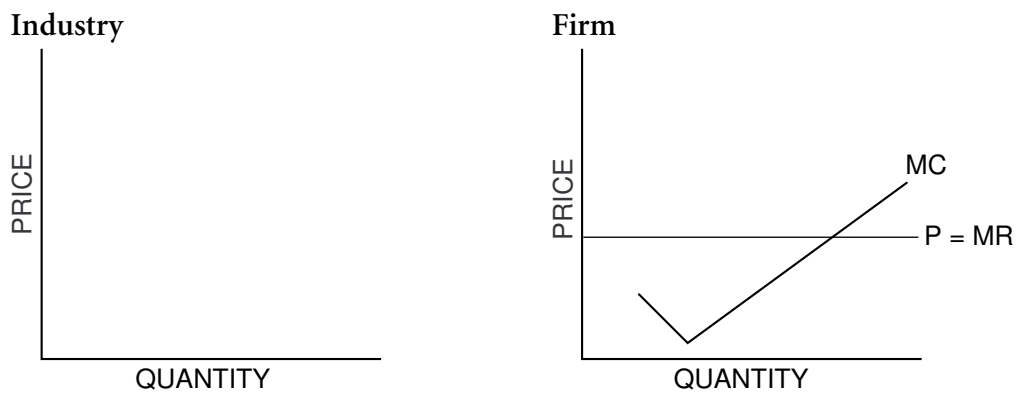
Industry

Firm

Explanation:

4. Long-run equilibrium for a firm and industry

✳ Figure 31.4
Long-Run Equilibrium

Industry

Firm
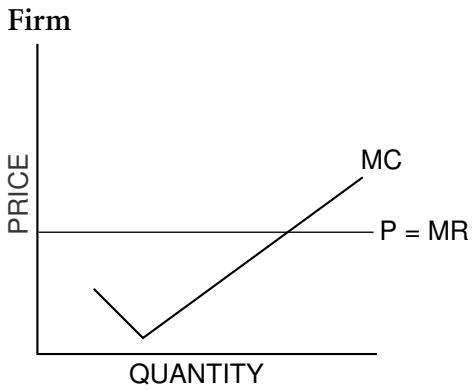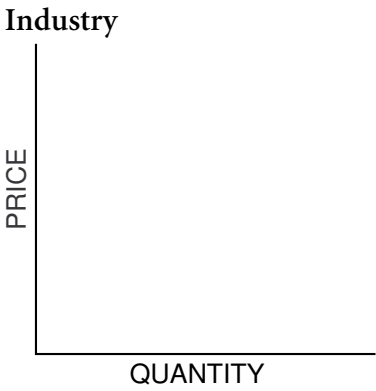
Explanation:

5. Illustrate how economic profits will disappear in the long run.

✳ Figure 31.5
From Short-Run Profit to Long-Run Equilbrium
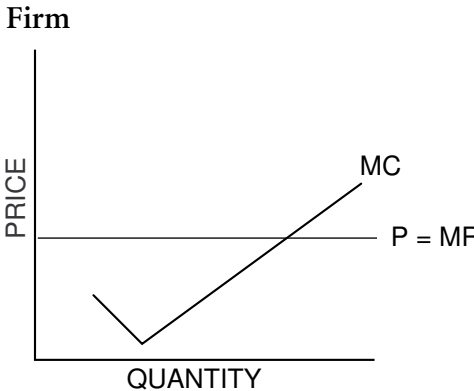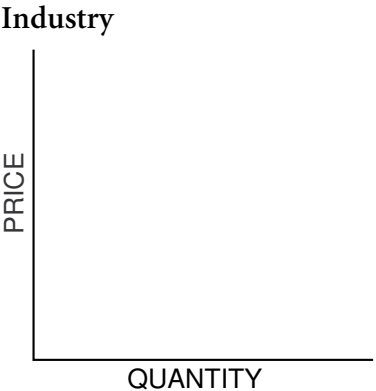
Industry

Firm

Explanation:

6. Illustrate how economic losses will disappear in the long run.

✳ Figure 31.6
From Short-Run Losses to Long-Run Equilbrium
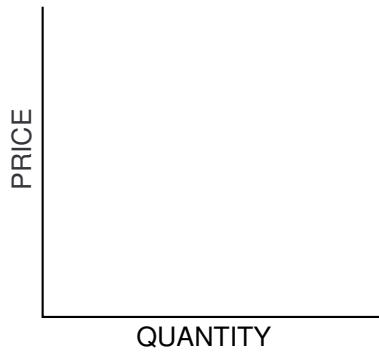
Industry   **Firm**
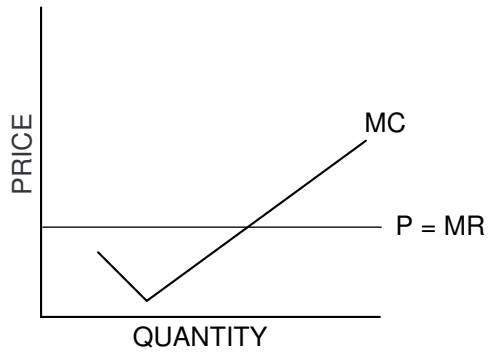
Explanation:

Marginal Revenue for an Imperfect Competitor

Marginal Revenue Pulls Average Revenue Toward It

Marginal revenue and price are not the same thing, but price and average revenue are the same concept with most applications of demand. With some control over price and output, imperfectly competitive firms realize that the additional revenue garnered from selling extra output changes at a different rate than the price of the good. Average revenue, defined as total revenue / output, falls as the price-searching firm increases output. Marginal revenue, defined as Δtotal revenue / Δoutput, falls even faster than average revenue as output increases.

Assuming the monopoly firm charges every buyer the same price, marginal revenue falls approximately twice as fast as price when the business offers additional units into the product market.

Look at the market-demand schedule in Figure 32.1. Buyer interest begins at a price of $13.50 when no units are demanded. With a $1.50 drop in price to $12.00, 100 units are demanded. Total revenue is $1,200 at the $12.00 price per unit; marginal revenue matches price on the first sales block of 100 units. When price falls to $10.50 per unit, no person pays a price below $10.50, yet marginal revenue is $9.00. What causes this result?

This monopoly firm, knowing that the market demand schedule is also the firm's demand schedule, recognizes that selling more units of product requires the same price for all buyers. It gives up the original price of $12.00 per unit and adopts $10.50. Total sales are 200 at a price of $10.50 per unit, yet the firm had to lower the price $1.50 on the first block of 100 units to generate the additional block of 100 units.

Thinking on the margin, the monopolist recognizes that lower prices for the first sales block caused the surrender of $150 in revenue on the first 100 demanded to gain the next sales block of 100 units. So the $1,050 gain in revenue from the last 100 sales requires a $150 deduction in revenue from the first sales block of 100 units. The last sales block, of an additional 100 units, brings $900 net revenue, all blocks considered.

Now it is time to fill in the missing data and then plot the data as a graph on Figure 32.2.

Fill in the blanks on the table, and plot both the demand curve and the marginal revenue curve on Figure 32.2. Label the demand curve D and the marginal revenue curve MR. (**Note:** Plot the marginal revenue data midway between the quantity levels shown in the second column of the table.) Then answer the following two questions.

1. Notice that the price points show $1.50 changes. By how much does marginal revenue change for each change in price points? _____

2. For a firm large enough to see the whole demand curve, marginal revenue is positive when the demand curve is price elastic. Marginal revenue becomes negative when the segment of the demand curve becomes price inelastic. Will a single-price monopoly ever operate on the inelastic portion of its demand curve? Why or why not?

✳ Figure 32.1
Average Revenue and Marginal Revenue for a Monopoly

Price (Average Revenue)	Quantity Demanded (Q)	Total Revenue (R)	Change in Total Revenue (ΔR)	Marginal Revenue (ΔR / ΔQ)
$13.50	0	$0		
12.00	100	1,200	$1,200	$12.00
10.50	200	2,100	900	9.00
9.00	300	2,700		
7.50	400			
6.00	500	3,000	0	0
4.50	600	2,700	−300	−3.00

✳ Figure 32.2
**Plotting Average Revenue and
Marginal Revenue for a Monopoly**
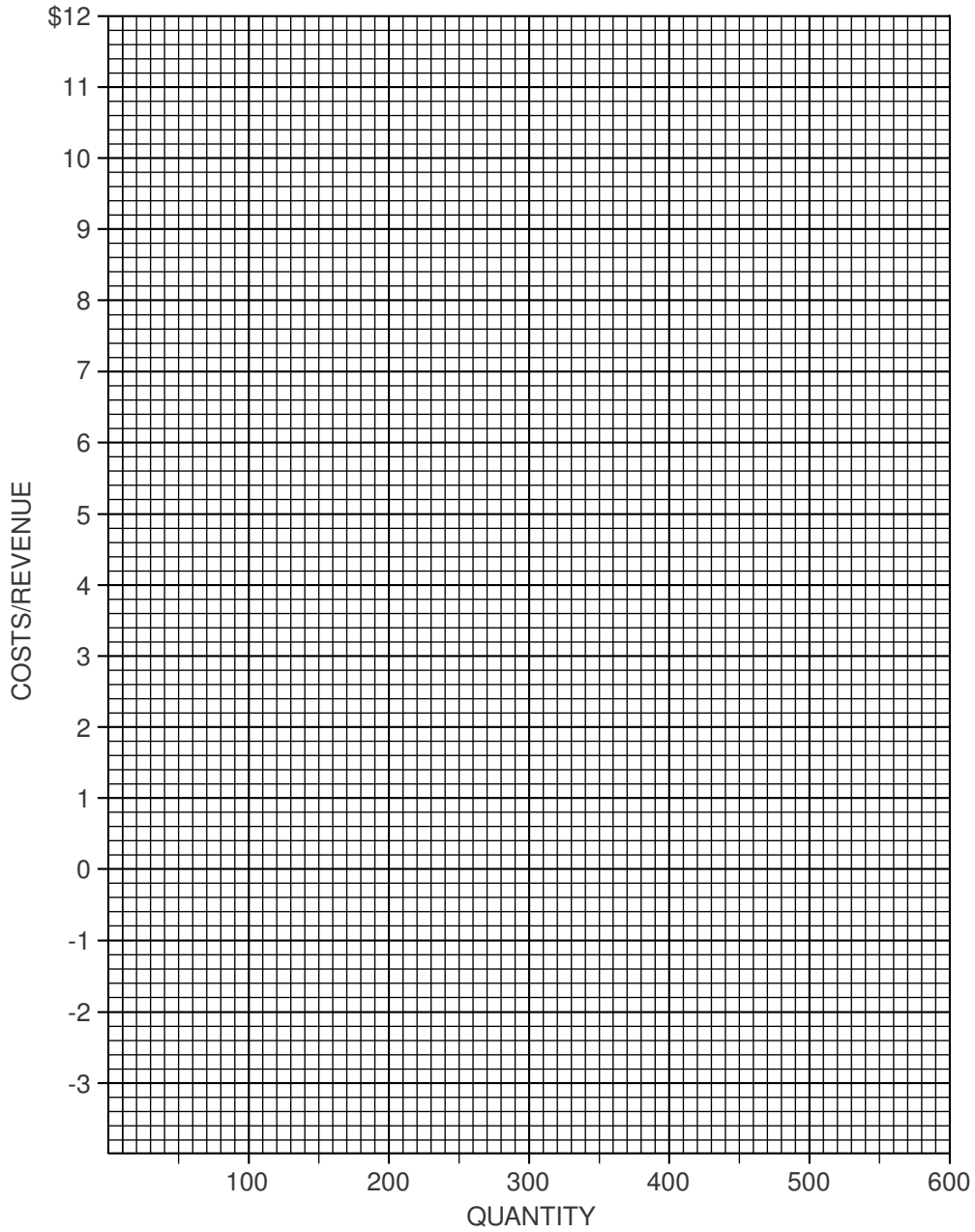
Pure Monopoly

Like other producers in a market economy, a pure monopolist tries to maximize profit by producing at an output where marginal cost (MC) equals marginal revenue (MR). For a firm in a competitive market, price and marginal revenue are the same; but for a monopolist, who "sees" the entire market demand curve and who must charge all buyers the same price, marginal revenue is below price. This activity considers the monopolist's choice of output level.

Part A

1. Figure 33.1 presents a summary of the relevant cost and revenue data facing a pure monopoly firm. Fill in the blanks on the table.

2. Plot the data for MC, MR, ATC (average total cost) and AR (average revenue) on Figure 33.2. (**Note:** For this problem plot MC and MR on the number.)

Figure 33.1

Pure Monopoly: Cost and Revenue Data

Quantity of Output	Total Cost	Marginal Cost	Average Total Cost	Total Revenue	Marginal Revenue	Average Revenue (Price)
0	$0	—	$0	$0	—	$0
1	900	$900	900	1,200	$1,200	1,200
2	1,600	700	800	2,100	900	1,050
3	2,100		700	2,700		900
4	2,400			3,000	300	
5	3,000	600		3,000		
6	4,200	1,200		2,700	−300	

Part B

After you have completed the table and the graph, answer these questions by filling in the blanks and shading in the area indicated in Question 7. In this problem, plot the MC and MR data at each quantity rather than at the midpoint. This is just for simplicity and does not change the fundamental analysis.

3. A profit-maximizing monopolist would produce an output of _____ units.

4. At this level of output, MC is _____ per unit and MR is _____ per unit.

5. At this level of output, ATC is _____ per unit, and AR (price) is _____ per unit.

---

6. This gives the monopolist an economic profit of _____ per unit for a total economic profit of _____.

7. Shade in the area on the graph that represents the total economic profit figure indicated in your answer to Question 6.

✳ Figure 33.2
Profit-Maximizing Equilibrium for a Monopoly

QUANTITY OF OUTPUT
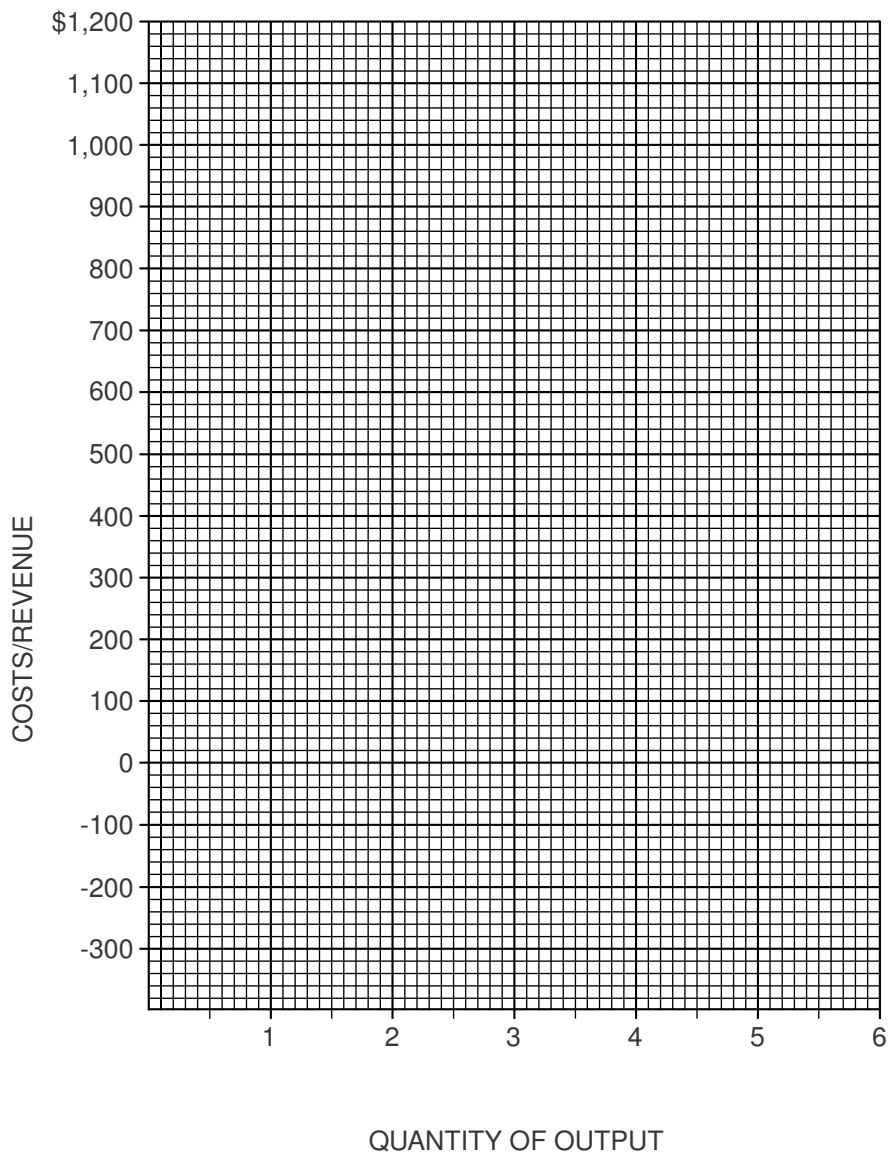
Monopoly Pricing

Part A
Equilibrium for the Perfectly Competitive Industry

Consider Figure 34.1. Assume that the market described by the figure is perfectly competitive, and MC represents the horizontal summation of marginal cost curves and, therefore, the market supply curve. Use Figure 34.1 to answer the following questions.

✳ Figure 34.1
Perfect Competition
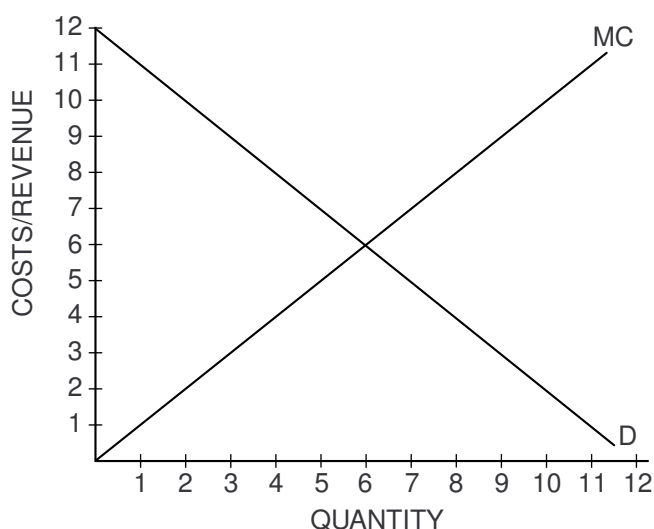
1. What quantity of output will be produced? _____

2. What price will the market establish? _____

3. Calculate the amount of the consumer surplus. Darkly shade the area of consumer surplus.

4. Calculate the amount of the producer surplus. Lightly shade the area of producer surplus.

_____
Activity written by Robert Graham, Hanover College, Hanover, Ind.

Part B
Equilibrium for the Monopolist

Now consider the same demand and cost curves, but assume the market is a monopoly. Therefore, MR represents the monopolist's marginal revenue curve and MC represents the monopolist's marginal cost curve. Using Figure 34.2, answer the following questions.

✳ Figure 34.2
Monopoly
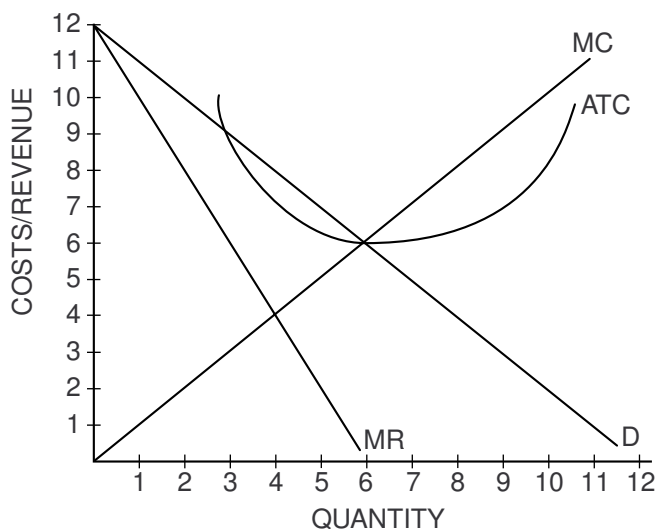
5. What quantity of output will be produced? _____ Why?

6. What price will the monopolist establish? _____ Why?

7. Calculate the amount of the consumer surplus. Darkly shade the area of consumer surplus.

8. Calculate the amount of the producer surplus. Lightly shade the area of producer surplus.

9. How does the price and output of a monopolist differ from that of the perfectly competitive industry?

10. What portion of the consumer surplus in the competitive situation was transferred to the firm in the monopoly situation?

11. How does a monopoly affect consumer surplus? Is this good or bad?

Let's Play Monopoly

Read the article and answer the questions that follow.

Let's Play Monopoly

By Robert J. Barro

It's almost the end of summer and time for the first annual contest to choose the best operating monopoly in America. The contestants, selected by a panel of Harvard economists, are as follows:

1. The U.S. Postal Service
2. OPEC
3. Almost any cable-TV company
4. The Ivy League universities (for administering financial aid to students)
5. The NCAA (for administering payments to student-athletes)

Some other worthy candidates, which just missed the cut, are the National Football League, the American Medical Association and the U.S. Departments of Agriculture and Defense.

Each contestant exhibits fine monopolistic characteristics and is worthy of serious consideration for the award. The U.S. Postal Service claims to be the longest-running monopoly in America and has the distinction of having its control over first-class mail prescribed (perhaps) by the Constitution. The monopoly has preserved large flows of revenues and high wage rates despite studies showing that private companies could carry the mail more efficiently at much lower cost.

On the other hand, the position of the Postal Service has been eroded: first, by successful competition on package delivery; second, by the recent entry of express-delivery services and third, and potentially most damaging, by the introduction of the fax machine. Since faxes are bound to supplant a substantial fraction of first-class letters, the failure to get Congress to classify a fax as first-class mail and, hence, the exclusive domain of the Post Office shows a remarkable loss of political muscle. Thus, despite past glories, it is hard to be sanguine about the long-term prospects of the Post Office as a flourishing monopoly.

Good Guys and Bad Guys

OPEC was impressive in generating billions of dollars for its members from 1973 to the early 1980s. To understand the functioning of this cartel, it is important to sort out the good guys from the bad guys. The good guys, like Saudi Arabia and Kuwait, are the ones who have typically held oil production below capacity and thereby kept prices above the competitive level. The bad guys, like Libya and Iraq (when Iraq was allowed to produce oil), are the ones who have produced as much as they could and thereby kept prices low.

The good guys were responsible for the vast expansion of oil revenues during the blissful period after 1973. (Hence, they were responsible for the considerable difficulties endured by oil consumers.)

But, unfortunately, these countries could not keep the other OPEC members in line and were also unable to exclude new producers or prevent conservation by consumers. Thus, oil prices plummeted in 1986 and only the start of the Persian Gulf crisis . . . [in 1991] could get prices temporarily back to a respectable level.

In any event, it is unclear that OPEC qualifies for the contest: It is not really American, and its members would probably be arrested for price-fixing if they ever held an official meeting in America.

Most cable-TV companies have government-issued licenses that keep competitors out. Thus, this business supports the hypothesis (offered, I think, by George Stigler) that private monopolies are not sustainable for long unless they have the weight of government behind them.

Fear About the Future

The rapid escalation of prices and the limitations on services seem, however, to be getting customers and their congressional representatives progressively more annoyed. Thus, it would not be surprising if legislative action leads soon to a deterioration of the cable companies' monopoly power. It may even happen that consumers will be able to choose among cable companies in the same way that they choose currently among long-distance telephone carriers; how could the struggling providers maintain a respectable cartel in that environment? This fear about the future diminishes the claim of this otherwise worthy contestant for the first annual prize.

Officials of Ivy League universities have been able to meet in semipublic forums to set rules that determine prices of admission (tuition less financial aid) as a function of applicant characteristics, especially financial resources. In some cases, the schools pooled information to agree in advance on the right price to charge a specific customer. Airlines and other industries that wish to price discriminate can only dream about this kind of setup.

Moreover, the universities have more or less successfully applied a high moral tone to the process: Rich applicants — especially smart rich applicants — are charged more than the competitive price for schooling in order to subsidize the smart poor, but it is unclear why this subsidy should come from the smart rich rather than from taxpayers in general.

In any event, the universities' enviable cartel position has been damaged by the unenlightened Justice Department, which argued that the price-setting meetings were a violation of antitrust laws. Since most of the universities involved have agreed to stop these practices, it may be that future prices for private higher education will come closer to being competitively determined. It seems that this prospect has already motivated some distinguished universities to declare themselves as being in financial difficulty.

Remarkably Successful

The final contestant, the NCAA, has been remarkably successful in holding down "salaries" paid to college athletes. It would be one thing merely to collude to determine price ceilings (for example, to restrict payments so that they not exceed tuition plus room and board and some minor additional amounts), but the NCAA has also managed to monopolize all the moral arguments.

Consider a poor ghetto resident who can play basketball well, but not well enough to make it to the NBA. If there were no NCAA, this player might be able legitimately to accumulate a significant amount of cash during a four-year career. But the NCAA ensures that the player will remain poor after four years and, moreover, has convinced most observers that it would be morally wrong for the college to pay the player a competitively determined wage for his or her services.

For many economists, this interference with competition — in a setting that has no obvious reasons for market failure — is itself morally repugnant. But the outrage is compounded here because the transfer is clearly from poor ghetto residents to rich colleges. Compare the situation of contestant number 4, the Ivy League universities, in which the transfer from rich to poor students can readily be supported on Robin Hood grounds.

The NCAA has the much more difficult task of defending a policy that prevents many poor individuals from earning money. Incredibly, this defense has been so successful that it has even allowed the organization to maintain the moral high ground. When the NCAA maintains its cartel by punishing schools that violate the rules (by paying *too* much), almost no one doubts that the evil entities are the schools or people who paid the athletes, rather than the cartel enforcers who prevented the athletes from getting paid. Given this extraordinary balancing act, the decision of the panelists was straightforward, and the NCAA is the clear and deserving winner of the first annual prize for best monopoly in America.

The panel of economists also considered briefly an award for the least-efficient monopoly in America. This choice was, however, too easy. It goes to the American Economic Association, which has been a dismal failure at establishing licensing requirements or other restrictions on entry into the economics profession. It is a sad state of affairs when almost anyone can assume the title of economist.

Let's Play Monopoly

1. Do you agree or disagree with the final contestants for the monopoly award? Explain.

2. How might e-mail change the market for first-class mail?

3. What prevents a cartel, particularly OPEC, from maintaining a long-run monopoly? What would help to make it more successful?

4. What are the standard arguments against monopolies? What example is provided in the reading that emphasizes these arguments?

5. What is price discrimination and under what conditions is it successful?

6. Why doesn't the NCAA have competition in providing a forum for young athletes to play sports?

7. How does leaving college early to go pro or going pro directly from high school affect the NCAA monopoly?

8. Why are monopolies considered to be bad? Be sure to discuss price, output and efficiency in your answer.

Price Discrimination

When producers have market power and they sell a good that cannot be resold, the possibility for price discrimination arises. Price discrimination occurs when a producer is able to charge consumers with different tastes and preferences different prices for the same good.

We know profit maximization for a firm that is able to set a single price occurs when the firm produces the quantity at which MR = MC. If a producer is able to price discriminate, however, then profits can be even higher.

Part A
Pricing with Market Power and Consumer Surplus

Pat's Patriotic Tattoos is the only tattoo parlor in town. Pat tattoos only images of the American flag. There are 20 consumers who are willing to buy a tattoo. Each consumer is interested in buying only one tattoo, but they vary in their willingness to pay. One consumer is willing to pay $20 for a tattoo; another is willing to pay $19; a third, $18, down to the consumer least willing to pay who has a reservation price of $1.

1. The demand schedule is given below in Figure 36.1. Complete the table.

Figure 36.1
Demand Schedule

Price	Quantity	Total Revenue	Marginal Revenue
$20	1		—
19	2		
18	3		
17	4		
16	5		
15	6		
14	7		
13	8		
12	9		
11	10		
10	11		
9	12		
8	13		
7	14		
6	15		
5	16		
4	17		
3	18		
2	19		
1	20		

Activity written by Kelly A. Chaston, Davidson College, Davidson, N.C.

2. Recalling Rules: Underline the correct answer.

   (A) A perfectly competitive firm would produce the output at which price is equal to
       (AC / MC / MR).

    (B) A monopolistic firm would produce the output at which MC is equal to *(AC / P / MR)*.

Part B
First-Degree Price Discrimination

3. Prove to yourself that a market price of $17 will generate a total consumer surplus of $6.
   Hint: The consumer surplus generated by the consumer willing to pay $20 is (20 – 17) x 1 = 3.

   CS =

4. Assume that the average and marginal costs are constant and equal to 14. If Pat produces the per-
   fectly competitive quantity and charges the perfectly competitive price,

   (A) what price will Pat charge for a tattoo? _____

   (B) what quantity will Pat supply? _____

   (C) what is the amount of consumer surplus generated? _____

      CS =

5. Assume that the average and marginal costs are constant and equal to 14. If Pat produces the
   monopoly quantity and charges the monopoly price,

   (A) what price will Pat charge for a tattoo? _____

   (B) what quantity will Pat supply? _____

   (C) what is the amount of consumer surplus generated? _____

      CS =

6. Again, assume that the average and marginal costs are constant and equal to 14. Now assume that
   Pat knows the tastes and preferences of all consumers and that the conditions that allow price dis-
   crimination apply.

   (A) What quantity will Pat supply? _____

   (B) At what prices will she sell tattoos?

      _____,   _____,   _____, $17,   _____,   _____,   _____

   (C) What is the amount of consumer surplus generated? _____

      CS =

7. Without calculating profit, explain how Pat's profits differ among cases 4, 5 and 6.

Part C
The Effects of Price Discrimination

Use the example of Pat's Patriotic Tattoos to make some conclusions about the effects of price discrimination.

8. What happens to consumer surplus if a firm successfully price discriminates?

9. What happens to the firm's profits if it successfully price discriminates?

10. What happens to the quantity supplied by a successful price-discriminating monopoly firm compared with a nonprice-discriminating monopoly firm?

11. How does the quantity supplied by a successful price-discriminating monopoly firm compare with the quantity supplied by firms in a perfectly competitive industry?

12. How does price discrimination affect economic efficiency?

Part D
Real Examples of Price Discrimination

13. Pat's Patriotic Tattoos is a fictional case. What are some real examples of price discrimination?

14. Use your examples to determine which factors make price discrimination easier.

15. Is price discrimination a good thing or a bad thing?

Regulating Monopoly

Suppose you are an analyst for a board that regulates local monopolies. Your supervisor has given you the three questions below. Using the information in Figure 37.1, answer your supervisor's questions.

✳ Figure 37.1
Regulating a Monopoly
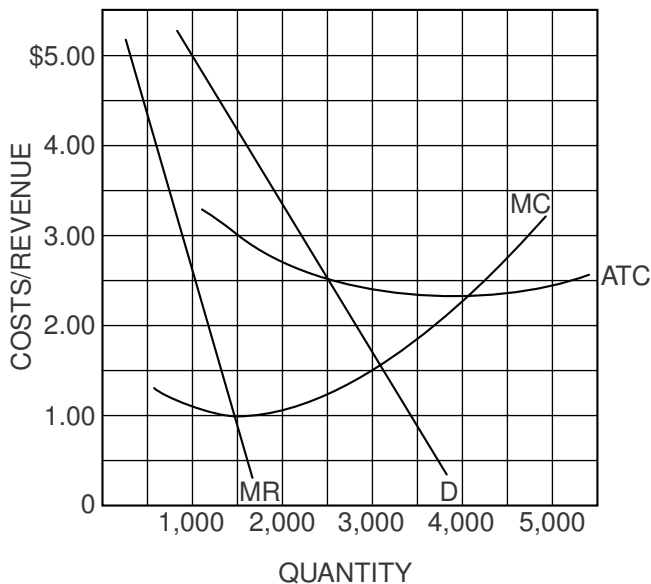
1. If this monopolist is not regulated, what will be the level of

   (A) output? _____

   (B) price? _____

   (C) total revenue? _____

   (D) total costs? _____

   (E) profit or loss? _____

2. If this monopolist is regulated by marginal cost pricing (i.e., the socially optimal price), what will be the level of

   (A) output? _____

   (B) price? _____

   (C) total revenue? _____

Adapted from Robert W. Pulsinelli and Roger LeRoy Miller, *Student Learning Guide to Accompany Economics Today,* 8th ed. (New York: HarperCollins College Publishers, 1994), p. 411.

(D) total costs? _____

(E) profit or loss? _____

(F) Will the monopoly need a subsidy? _____

(G) If so, how much? _____

3. If cost-of-service regulation (fair-return price or average cost pricing) is imposed on this monop-olist, what will be the level of

(A) output? _____

(B) price? _____

(C) total revenue? _____

(D) total costs? _____

(E) profit or loss? _____

4. What are the advantages and disadvantages of marginal cost pricing?

5. What are the advantages and disadvantages of cost-of-service regulation?

Monopoly Consultants, Inc.

You have been retained by seven corporations to advise them on their future output and price decisions. These firms are listed on Figure 38.1. Each firm is a pure monopoly and desires to maximize its profits or minimize its losses. Before making your recommendations, fill in as much of the incomplete data in the table as possible. Although you may not be able to fill in every box, there are sufficient data in each case to recommend action that is in the best interest of the firm.

After you have analyzed each case, decide which statement below is the best course of action for the firm involved. Place the number of the statement in the answer column.

1. Nonsense: The information is inconsistent and could not be correct.
2. This firm is in the correct position.
3. This firm should shut down in the short run because its revenue does not exceed variable cost.
4. This firm should shut down in the long run because its revenue does not exceed total cost.
5. This firm should reduce production and increase price.
6. This firm should increase production and reduce price.

Figure 38.1
Monopoly Consultants, Inc. Monopoly Model

Case	Price	Marginal Revenue	Quantity Output	Total Revenue	Total Cost	Fixed Cost	Average Total Cost	Marginal Cost	Answer
1	$1.25	$1.00	10,000			$2,000	$1.50	$1.00	
2	5.00	4.00	1,000		$4,000		minimum level		
3	1.50	2.00	10,000				2.00	2.00	
4	above marginal revenue	5.00					5.00	5.00	
5			4,000	$8,000	7,200			2.00	
6	7.00	4.00	2,000					3.00	
7			5,000	9,000	10,000	declining	minimum level		

A Quick Review of Perfect Competition and Monopoly

✳ Figure 39.1
Graphs of Monopoly and Perfect Competition

Monopoly

Perfect Competition
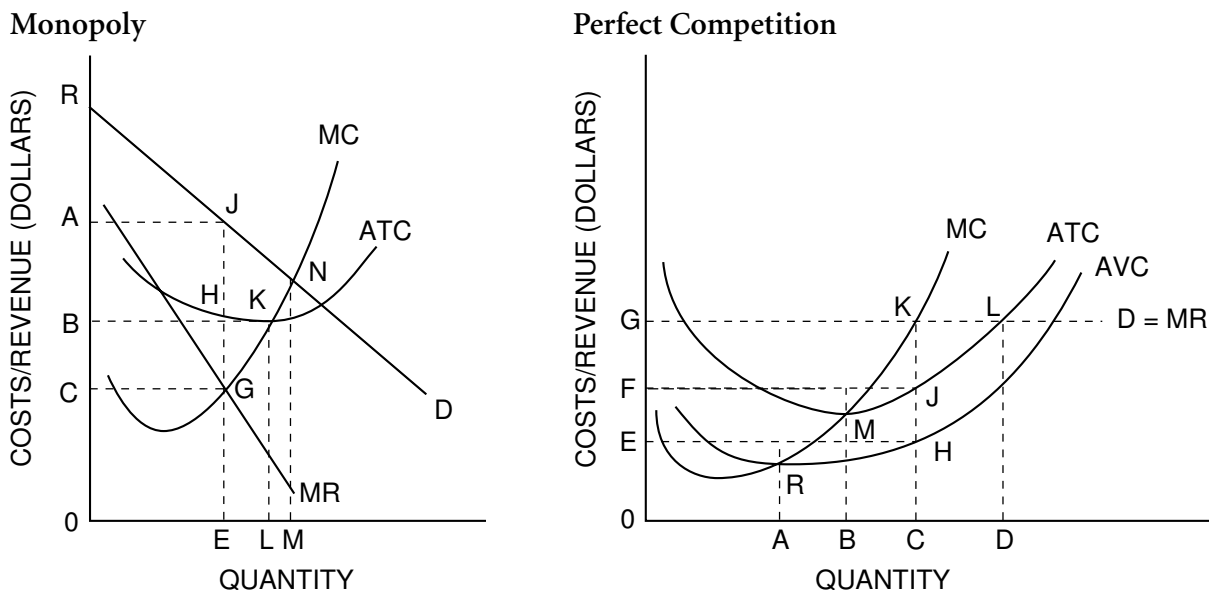
These questions are based on Figure 39.1. Underline the correct answer. Assume that the monopoly can set only one price. Both the monopoly and the perfect competitor seek to maximize profits.

1. A monopoly firm will maximize profits at what price?
   (A) 0A   (B) 0B   (C) 0C   (D) 0R

2. Economic profits for the monopoly firm are represented by the area of which rectangle?
   (A) 0CGE   (B) 0AJE   (C) AJHB   (D) BAJN

3. Total costs for the monopoly firm are represented by the area of which rectangle?
   (A) BKL0   (B) CGE0   (C) AJE0   (D) BHE0

4. The total revenue for the monopoly firm is represented by the area of which rectangle?
   (A) 0CGE   (B) 0AJE   (C) AJHB   (D) BAJH

5. The perfect competitor will maximize profits at what output level?
   (A) 0A   (B) 0B   (C) 0G   (D) 0D

The graphs for this activity are from *Test Bank 1 to Accompany Campbell McConnell, Economics,* 10th ed. (New York: McGraw-Hill Book Co., 1987). Activity written by John Morton, National Council on Economic Education, New York, N.Y.

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6. The perfect competitor will shut down below which price-output relationship?
   (A) K   (B) M   (C) L   (D) R

7. At price 0G, the area of which rectangle represents total revenue for the profit-maximizing perfect competitor?
   (A) 0GKC   (B) 0FJC   (C) FGKJ   (D) EFJH

8. At output 0C, total variable cost is represented by the area of which rectangle?
   (A) 0GKC   (B) FGKJ   (C) 0EHC   (D) 0FJC

9. At price 0G, profits for the perfect competitor are represented by the area of which rectangle?
   (A) 0GKC   (B) 0FJC   (C) FGKJ   (D) 0EHC

10. At what price-output relationship will a perfect competitor operate in the long run?
    (A) K   (B) L   (C) M   (D) R

11. For the monopolist, what is the area of consumer surplus?
    (A) ABHJ   (B) AJGC   (C) ARJ   (D) ARJE

Monopolistic Competition

✳ Figure 40.1
Monopolistically Competitive Firm in the Short Run
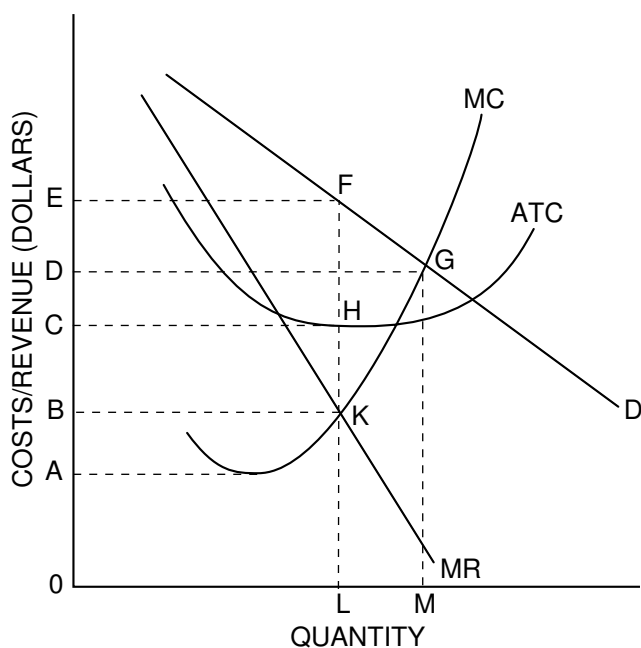
1. Use Figure 40.1 to answer these questions.

   (A) At what level of output will this firm operate? _____

   (B) What is marginal revenue at this level of output? _____

   (C) What price will this firm charge for its product? _____

   (D) The area of which rectangle is equal to total revenue? _____

   (E) What is the firm's average total cost? _____

   (F) The area of which rectangle is equal to the firm's total cost? _____

   (G) Is the firm making profits or incurring losses? _____

   (H) The area of which rectangle is equal to profits or losses? _____

2. Would the demand curve for a monopolistic competitor be more or less elastic than the demand curve for a monopolist? Justify your answer.

3. What are the characteristics of a monopolistically competitive market? In what sense is there competition and in what sense is there monopoly in this type of market structure?

4. What are three examples of monopolistically competitive markets?

5. True, false or uncertain, and why? "Monopolistic competition is just another form of pure monopoly."

6. True, false or uncertain, and why? "Monopolistic competition is even better than perfect competition."

7. True, false or uncertain, and why? "In the long run, monopolistic competitors produce at their most efficient point."

Game Theory

Strategic thinking is the art of outdoing an adversary, knowing that the adversary is trying to do the same to you.   Dixit and Nalebuff

Game theory is used to explain how two or more players make decisions or choose actions when their actions (or strategies) affect each participant. Each player determines his or her best response to the possible actions of every other player. According to game theory, a player's choice of strategy depends on the strategy the player thinks other players will choose. In some cases, these strategies reinforce each other, but in other cases, they do not. When the chosen strategies reinforce each other, the game achieves what is called a *Nash Equilibrium*. The Nash Equilibrium is named after John F. Nash, Jr., who was co-winner of the 1994 Nobel Prize in Economics for his work in this area and the subject of the 2001 movie *A Beautiful Mind*.

Game theory provides insights into how business and government decisions are made and has numerous real-world applications. For example, game theory has helped economists analyze antitrust policy, tariff wars and auctioning behavior. This lesson is an introduction to the basic elements of game theory. As you do the math, think about the implications of the results.

Part A
The Basic Elements of Game Theory

The three basic elements of a game are

    (A) the players,

    (B) the strategies available to each player,

    (C) the payoffs each player receives.

These three elements are summarized in a table called a *payoff matrix*. A payoff matrix describes the payoffs to each player for combinations of given strategies. Here is an example of a payoff matrix:

		Coke	
		Advertise	Don't Advertise
Pepsi	Advertise	80, 80	120, 45
	Don't Advertise	45, 120	100, 100

The first number in each square refers to the payoff for the row (horizontal) player, here Pepsi. The second number in each square refers to the payoff for the column (vertical) player, here Coke. The numbers represent the profit for Pepsi and Coke.

In this game:

    (A) The players are Pepsi and Coke.

    (B) The strategies available to each player:

       ■ Pepsi, as the row player, can choose either Advertise or Don't Advertise.

       ■ Coke, as the column player, can choose either Advertise or Don't Advertise.

Activity written by Pamela Schmitt, U.S. Naval Academy, Annapolis, Md.

(C) The payoffs each player receives:

- If Pepsi chooses Advertise and Coke chooses Advertise, Pepsi earns 80 and Coke earns 80.
- If Pepsi chooses Advertise and Coke chooses Don't Advertise, Pepsi earns 120 and Coke earns 45.
- If Pepsi chooses Don't Advertise and Coke chooses Advertise, Pepsi earns 45 and Coke earns 120.
- If Pepsi chooses Don't Advertise and Coke chooses Don't Advertise, Pepsi earns 100 and Coke earns 100.

Each player gains a lot from advertising when the other player does not advertise because the advertiser gains a larger share of the market. If both advertise, the gain is less than if both don't advertise because advertising costs money.

In some games, one player will have a *dominant strategy*. A dominant strategy is the best strategy for one player regardless of the strategy the other player follows. In the game with Pepsi and Coke, the dominant strategy for Pepsi is to choose Advertise. This is because Pepsi earns more regardless of which strategy Coke chooses.

- If Coke chooses Advertise, Pepsi earns 80 choosing Advertise, which is greater than earning 45 from choosing Don't Advertise.
- If Coke chooses Don't Advertise, Pepsi earns 120 choosing Advertise, which is greater than earning 100 from choosing Don't Advertise.

The dominant strategy for Coke is to choose Advertise. This is because Coke earns more regardless of what Pepsi chooses.

- If Pepsi chooses Advertise, Coke earns 80 choosing Advertise, which is greater than earning 45 from choosing Don't Advertise.
- If Pepsi chooses Don't Advertise, Coke earns 120 choosing Advertise, which is greater than earning 100 from choosing Don't Advertise.

A *dominated strategy* yields a lower payoff than at least one other strategy. In this game, the dominated strategy for Pepsi is Don't Advertise; it is dominated by Advertise. Regardless of the strategy selected by Coke, Pepsi gains more by choosing Advertise. If Pepsi chooses Don't Advertise, the payoff is 45, while a strategy of Advertise has a payoff of 80. Since 45 is less than 80, the dominated strategy is Don't Advertise.

The dominated strategy for Coke is Don't Advertise; it is dominated by Advertise. If Coke chooses Don't Advertise, Coke receives 45 if Pepsi chooses Advertise and 100 if Pepsi chooses Don't Advertise. Since 45 is less than 100, the dominated strategy for Coke is Don't Advertise.

A Nash Equilibrium is a combination of strategies for each player, such that each chooses his or her best response to the other's strategy choice. In this game, the Nash Equilibrium is Pepsi choosing Advertise and Coke choosing Advertise. Although in this example both Coke and Pepsi select the same strategy, in a Nash Equilibrium the players do not have to select the same strategy.

If Coke chooses Advertise, Pepsi is better off choosing Advertise (80 compared with 45). If Coke chooses Don't Advertise, Pepsi is better off choosing Advertise (120 compared with 100). So whatever

strategy Coke chooses, Pepsi is always better off choosing Advertise. Note that Pepsi has no incentive to choose any strategy other than Advertise.

Likewise if Pepsi chooses Advertise, then Coke is always better off choosing Advertise (80 compared with 45). If Pepsi chooses Don't Advertise, Coke is always better off choosing Advertise (120 compared with 100). So whatever strategy Pepsi chooses, Coke is always better off choosing Advertise. Note that Coke has no incentive to choose any strategy other than Advertise.

A Nash Equilibrium is similar to a market equilibrium in that there is no incentive for producers and consumers to change from the equilibrium price. Thus a Nash Equilibrium is an "enforceable" equilibrium because the firms do not have an incentive to cheat as they might in a cartel.

Other economic examples of game-theory applications are decisions by firms about what price to charge, whether to enter a market, where to locate and what kind of product or quality level to produce; decisions by a central bank on monetary policy actions and decisions by a nation on the optimal tariff policy.

Part B
The Prisoner's Dilemma Game

One classic type of game is the *prisoner's dilemma game*. Prisoner's dilemma games are games in which each player has a dominant strategy; and when both players play the dominant strategy, the payoffs are smaller than if each player played the dominated strategy. The dilemma is how to avoid this bad outcome.

The basics of the prisoner's dilemma game are as follows: Two prisoners have the option to confess or not confess to a crime they committed. The prosecutor has only enough information to convict both criminals of a minor offense and is, therefore, relying on a confession. The minor offense carries one year in jail. The prisoners are questioned in different cells, without the ability to communicate. They are told that if one prisoner confesses while the other remains silent, the prisoner confessing will go free and the prisoner remaining silent will serve 20 years in jail. If both prisoners confess, both prisoners will serve three years in jail.

If a player goes free, the payoff is 0. If a player serves one year in jail, the payoff is –1. If a player spends 20 years in jail, the payoff is –20. Use these numbers in your payoff matrix. Note that the negative numbers come from losing years of freedom.

1. Determine the three basic elements of the game.

    (A) The players:

    (B) The strategies for each player:

    (C) The payoffs for each player:

2. Create a payoff matrix for the prisoner's dilemma game.

3. Identify any dominant strategies.

4. Identify any dominated strategies.

5. Find the Nash Equilibrium.

Part C

Variation of the Prisoner's Dilemma Game

You are in a class with one other student. It is the end of the semester, and final exams are in a week. Your teacher has said the final exam will be graded so that anyone who scores the class average on the final exam will receive a "B" in the class. Anyone who scores above the average will receive an "A" in the class, and anyone who scores below the average will fail the class. You would certainly score higher on the exam than the other student. You and the other student have made an agreement not to take the final exam so that the class average is zero and you both receive "B" grades.

6. Determine the three basic elements of the game.

   (A) The players:

   (B) The strategies for each player:

   (C) The payoffs for each player:

7. Create a payoff matrix for this game.

8. What is your dominant strategy? (Underline the correct answer)
   Take the Exam or *Not Take the Exam*

9. Using a four-point scale (A = 4, B = 3, C = 2 and D = 1), which choice results in the highest class GPA?

   If you finished Parts B and C correctly, you will realize that when each player chooses his or her dominant strategy, the result is unattractive to the group.

   The key to avoiding the prisoner's dilemma outcome of lower payoffs for both players is to find a way for players to credibly commit to playing a dominated strategy. Merely having both prisoners agree to Not Confess or both students to Not Take the Exam will not work. This results because it is always optimal for Prisoner 1 (or Prisoner 2) to still play the Confess strategy, and it is always optimal

for the better student to play the Take the Exam strategy. One possible way to have credible commitment in the prisoner's dilemma game would be to have both prisoners reveal another past crime they committed, thus ensuring that if they confess to this crime, the other prisoner will have additional information to punish the prisoner who cheats on an agreement to not confess.

One way to do this is to form a *cartel*. A cartel is a coalition of firms that coordinate their decisions to reach a more optimal solution for all members of the group by finding ways to credibly commit players to play their dominated strategies. Cartels, however, are not always successful in maintaining their agreements because there may be an incentive for a member to cheat on the cartel.

Part D
Questions

10. Is the Coke and Pepsi advertising game a prisoner's dilemma game? Explain why or why not.

11. Interpret "standing at a concert" in terms of the prisoner's dilemma game.

12. Explain at least one way the optimal outcome for players, which would be for all players to play the dominated strategy, can be reached in Question 11. What are the possible commitment problems?

13. A rivalry exists between the U.S. jet producer Boeing and the European jet producer Airbus. Each government has the opportunity to subsidize its jet producer to give it a competitive edge in the global market. Using game theory, explain what you would expect to observe in practice.

Market Structure and Business Decision Making

Answer the questions and briefly explain your answers. Please use diagrams to illustrate your point.

1. True, false or uncertain, and explain why? "Monopolies always charge the highest possible price."

2. True, false or uncertain, and explain why? "To find a monopoly, look for bigness. For example, monopoly is more likely to be found in the oil business than in the dry-cleaning business."

3. True, false or uncertain, and explain why? "If all the firms in an industry raise their prices at the same time, one can be pretty sure that there is collusion or monopoly behavior in this industry."

4. After several losing seasons, a college is considering dropping football. The college has concluded it needs an athletic director for other sports. To what extent should the college's decision makers consider the following budget items? (Hint: Consider variable and fixed costs.)

   (A) Tuition scholarships

   (B) Payments on the stadium's mortgage

   (C) Free tickets to the games for students

   (D) Salary of the athletic director

   (E) Salary of the football coach and assistant coaches

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5. True, false or uncertain, and explain why? "The marginal cost curve for a perfectly competitive firm is the same thing as its supply curve."

6. True, false or uncertain, and explain why? "If marginal cost equals marginal revenue, a firm must be breaking even because costs and revenue are equal."

7. The Crazy Toy Company produces yo-yos. Figure 42.1 gives the total revenue and total cost associated with the production of a certain number of yo-yos. Fixed costs are $1,200.

Figure 42.1
Crazy Toy Company Yo-Yo Schedule

Number of Yo-Yos Produced	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost
0	$0	—	$1,200	—
1	150	$150	1,300	$100
2	275	125	1,350	50
3	375	100	1,425	75
4	460	85	1,505	80
5	540	80	1,595	90
6	600	60	1,700	105
7	640	40	1,820	120
8	670	30	1,960	140

(A) What are the fixed and variable costs associated with each level of output?

(B) What is the optimal production level for the firm?

(C) In the short run, should the firm shut down? Explain your answer.

8. Why do airlines charge a discounted fare to passengers who stay over on a Saturday night? (Hint: Consider price discrimination.)

9. Assume your economics teacher got a scholarship to study in Europe this summer. Therefore, the teacher's family wants to rent its house for the summer. They figure if no one rents it, it will still cost them $700 a month in principal, interest and property insurance. It will cost them an additional $200 a month to maintain it if someone occupies it.

(A) How much rent must they charge to cover all costs? _____

(B) What is the minimum rent they should be willing to accept before they would leave the house unoccupied? _____ Why?

10. True, false or uncertain, and explain why? "Without government regulations most firms in a capitalist market system would be monopolies."

11. Draw a graph illustrating a monopoly market. Include the demand curve, the marginal revenue curve and the marginal cost curve.

(A) Indicate the equilibrium quantity for the monopolist, and label it Q.

(B) Indicate the equilibrium price, and label it P.

(C) Shade the area of consumer surplus for the monopolist market.

(D) Indicate the equilibrium price and quantity, if your diagram indicates conditions of perfect competition, and label them respectively P_1 and Q_1.

(E) Using diagonal lines, indicate the area of consumer surplus if the monopoly were actually a perfectly competitive industry.

(F) Does the monopoly model exhibit allocative efficiency? Why or why not?

(G) Does a perfectly competitive industry exhibit allocative efficiency? Why or why not?

12. Why is game theory important to an oligopolist?

Sample Multiple-Choice Questions

Circle the letter of each correct answer.

1. True statements about the theory of the firm in the short run and long run include which of the following?
   I.   All input costs are fixed in the short run.
   II. All input costs are variable in the long run.
   III. At least one input price is fixed in the short run.

   (A) I only

   (B) II only

   (C) III only

   (D) I and II only

   (E) II and III only
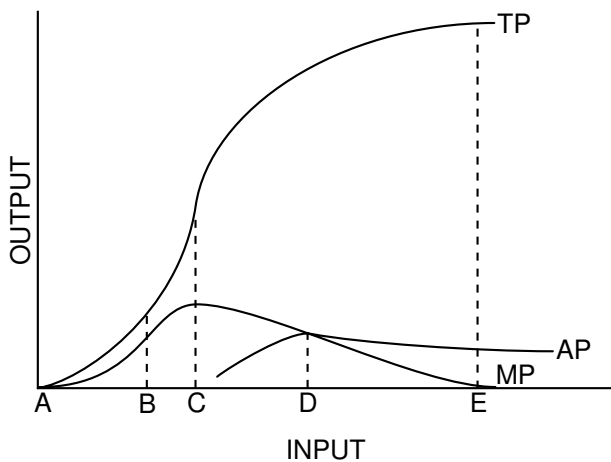
2. On the graph above, the onset of diminishing marginal returns occurs beyond

   (A) Point A.

   (B) Point B.

   (C) Point C.

   (D) Point D.

   (E) Point E.

3. Which of the following statements about a firm's production function are true?
   I.   When total product is at its maximum, marginal product is zero.
   II. When total product rises, marginal product is rising.
   III. When marginal product is greater than average product, average product is rising.
   IV. When marginal product is less than average product, average product is falling.

   (A) I and II only

   (B) II and III only

   (C) II and IV only

   (D) I, III and IV only

   (E) I, II, III and IV
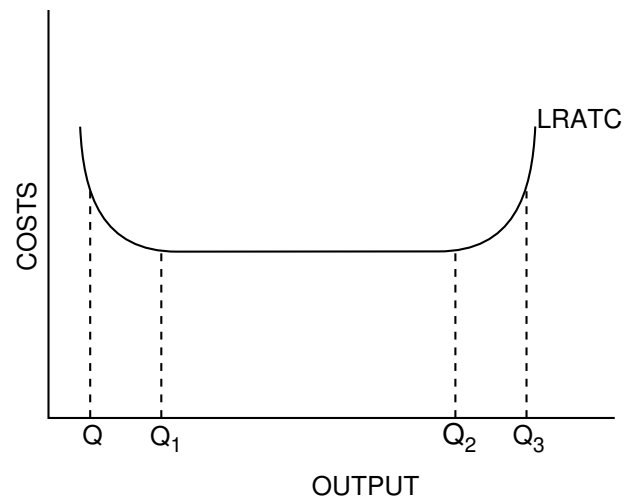
4. According to graph above, if the firm is producing any quantity greater than Q_2, the firm is experiencing

   (A) economies of scale.

   (B) minimum efficient scale.

   (C) diseconomies of scale.

   (D) constant returns.

   (E) increasing returns.

5. For a perfectly competitive firm, if the market price is $8 then

(A) marginal revenue is greater than $8.

(B) marginal revenue is less than $8.

(C) marginal revenue is equal to $8.

(D) average revenue is greater than $8.

(E) average revenue is less than $8.

6. A firm's short-run marginal cost curve will eventually increase because of

(A) more efficient production.

(B) economies of scale.

(C) diseconomies of scale.

(D) diminishing marginal returns.

(E) increasing marginal returns.

7. Assume that in the short run at the profit-maximizing output, the price is lower than average variable cost. The perfectly competitive firm should

(A) increase its price.

(B) decrease its price.

(C) increase its output.

(D) decrease its output.

(E) shut down.

8. Assume that a perfectly competitive firm is operating where marginal revenue is greater than marginal costs. To increase profits, the firm should

(A) increase production.

(B) decrease production.

(C) increase price.

(D) decrease price.

(E) do nothing.

9. If the average variable cost of producing five units of a product is $100 and the average variable cost of producing six units is $125, then the marginal cost of producing the sixth unit is

(A) $125.

(B) $2.

(C) $250.

(D) $350.

(E) $750.
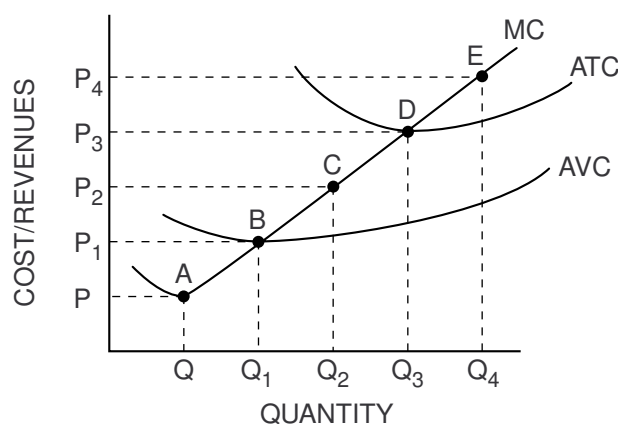
Use the graph above to answer questions 10, 11 and 12.

10. If the firm is in short-run equilibrium at a price of P_4, a perfectly competitive firm will maximize profits by producing at which of the following levels of output?

(A) Q   (B) Q_1 (C) Q_2

(D) Q_3 (E) Q_4

11. At which price will this perfectly competitive firm make an economic profit?

(A) P   (B) P_1 (C) P_2

(D) P_3 (E) P_4

12. Which price-quantity combination represents long-run equilibrium for this perfectly competitive firm?

(A) Point A   (B) Point B   (C) Point C

(D) Point D   (E) Point E
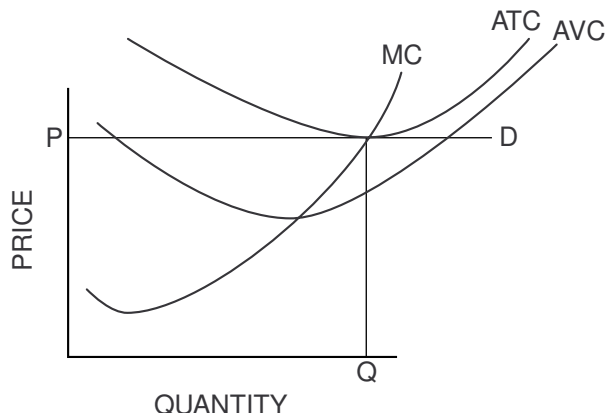
13. According to the graph above, if the firm is producing at Q, the firm is

(A) losing money because the firm is operating at the shutdown point.

(B) losing money because the price does not cover average fixed cost.

(C) making profits because the price is above average variable cost.

(D) making normal profits because the price just covers average total cost.

(E) making normal profits because the price is above average variable cost.

14. Which of the following represents the correct relationship between the demand curve for a perfectly competitive industry and the demand curve for a perfectly competitive firm?

	PC Industry Demand	PC Firm Demand
(A)	Downward slope to the right	Downward slope to the right
(B)	Downward slope to the right	Perfectly elastic
(C)	Perfectly elastic	Downward slope to the right
(D)	Perfectly elastic	Perfectly elastic
(E)	Perfectly inelastic	Perfectly elastic
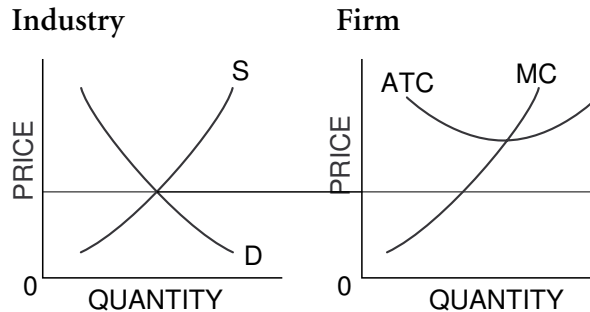
15. According to the graphs above, in which of the following ways are the industry supply curve and the equilibrium price most likely to change in the long run?

	Industry Supply	Equilibrium Price
(A)	Decrease	Decrease
(B)	Decrease	Increase
(C)	Increase	Decrease
(D)	Increase	Increase
(E)	Not change	Decrease
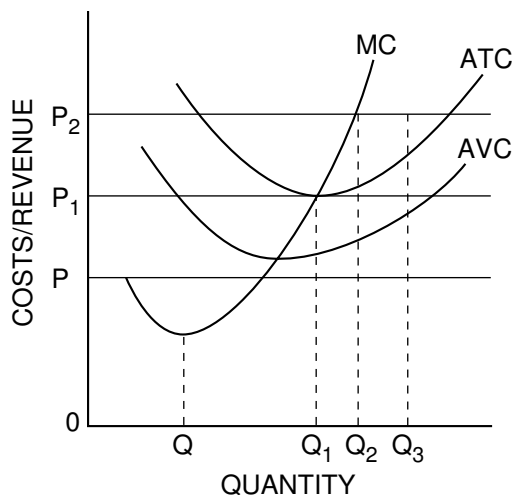
Use the graph above to answer questions 16 and 17.

16. If price is P_2, the firm will

(A) produce Q units and earn a normal profit.

(B) produce Q units and earn an economic profit.

(C) produce Q_2 units and earn an economic profit.

(D) produce Q_3 units and earn an economic profit.

(E) shut down.

17. If price is P_1, the firm will

(A) produce Q units and earn an economic profit.

(B) produce Q_1 units and earn an economic profit.

(C) produce Q_1 units and earn a normal profit.

(D) produce Q_2 units and earn an economic profit.

(E) shut down.

18. Which of the following is true of a pure monopolist's demand curve?

(A) It is perfectly inelastic.

(B) It is perfectly elastic.

(C) It coincides with its marginal revenue curve.

(D) It lies below its marginal revenue curve.

(E) It lies above its marginal revenue curve.

19. Average fixed cost is shown as the distance between

(A) marginal cost and average variable cost.

(B) marginal cost and average total cost.

(C) average variable cost and average total cost.

(D) average total cost and the horizontal axis.

(E) marginal cost and the horizontal axis.
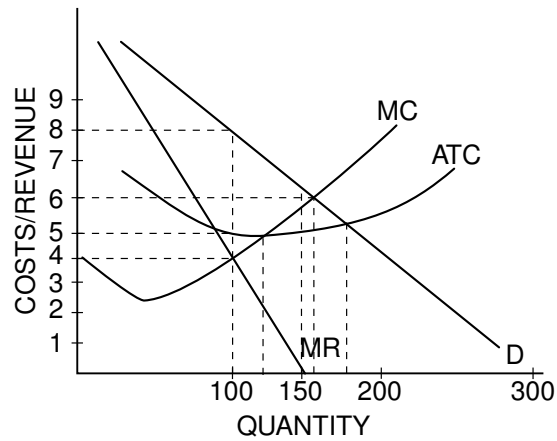
Use the graph above to answer questions 20 and 21.

20. Assume that the firm in the graph above is an unregulated monopolist. It will produce

(A) 175 units at a price of $7.00.

(B) 100 units at a price of $6.00.

(C) 100 units at a price of $8.00.

(D) 150 units at a price of about $5.00.

(E) about 210 units at a price of about $4.00.

21. Assume that the firm in the graph is an unregulated monopolist. It will earn long-run profits of

(A) $0.

(B) $300.

(C) $400.

(D) $500.

(E) $900.
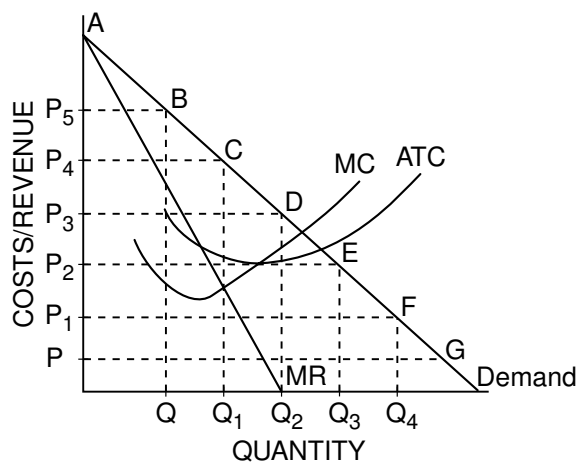
Use the graph above to answer questions 22 through 25.

22. For the firm in the graph — an unregulated monopolist — the price elasticity of demand is unit elastic at a price and an output of

(A) P_5 and Q. (B) P_4 and Q_1.

(C) P_3 and Q_2. (D) P_2 and Q_3.

(E) P_1 and Q_4.

23. Consumer surplus for this profit-maximizing monopolist will be represented by area

(A) ABP_5. (B) ACP_4.

(C) ADP_3. (D) AEP_2.

(E) AGP.

24. The profit-maximizing price for this firm is

(A) P_1. (B) P_2.

(C) P_3. (D) P_4.

(E) P_5.

25. Total revenue will be maximized when price is equal to

(A) P. (B) P_1. (C) P_2.

(D) P_3. (E) P_4.
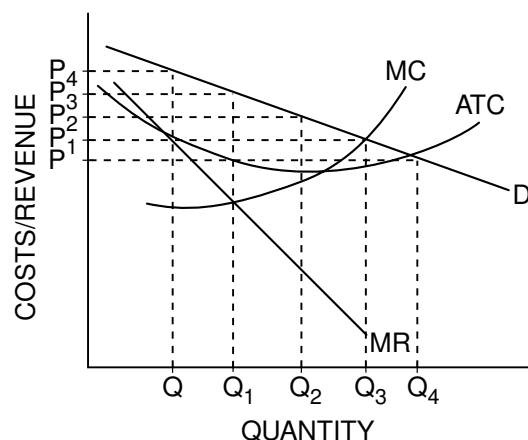
Questions 26, 27 and 28 are based on the graph above of cost and revenue curves for a monopoly firm.

26. To maximize profit, this monopolist should produce at which of the following levels of output?

(A) Q (B) Q_1

(C) Q_2 (D) Q_3

(E) Q_4

27. The price the monopolist charges at the profit-maximizing level of output will be

(A) P. (B) P_1.

(C) P_2. (D) P_3.

(E) P_4.

28. The profit per unit will be

(A) PP_1. (B) PP_3.

(C) $P_1 P_2$. (D) 0P.

(E) $0P_3$.
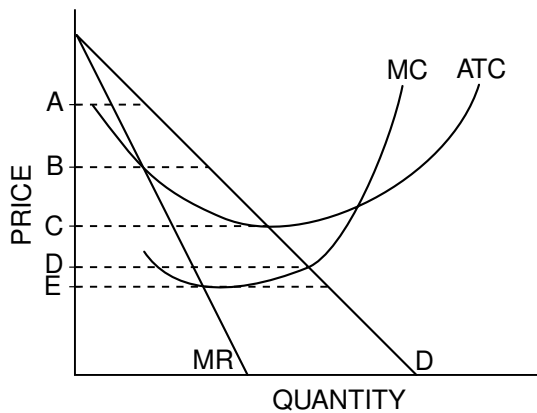
Use the graph above to answer questions 29 and 30.

29. Under the usual regulated monopoly, the socially optimal regulated price is
    (A) A.   (B) B.   (C) C.
    (D) D.   (E) E.

30. Under the usual regulated monopoly, the price that allows fair return (where all costs are covered and includes a normal rate of return) is
    (A) A.   (B) B.   (C) C.
    (D) D.   (E) E.

31. What happens to a monopolist's price, profits and output if its fixed costs decrease?

	Price	Profits	Output
(A)	Decrease	Increase	Decrease
(B)	Decrease	Decrease	Decrease
(C)	No change	Increase	No change
(D)	Increase	Increase	Increase
(E)	Decrease	No change	Increase

32. Allocative and productive efficiency are possible in which of the following unregulated market structures?
    I.   Perfectly competitive
    II. Pure monopoly
    III. Oligopoly
    IV. Monopolistically competitive
    (A) I only
    (B) II only
    (C) III only
    (D) I and IV only
    (E) II and IV only

33. Which of the following is true of monopolists who practice price discrimination?
    (A) They charge all customers the same price.
    (B) They earn a smaller profit than those who do not practice price discrimination.
    (C) They charge customers different prices according to different elasticities of demand.
    (D) They produce lower quantities than pure monopolists.
    (E) They produce the same quantity of output as pure monopolists.

34. Characteristics of an oligopolistic market include which of the following?
    I.   Easy entry and exit of firms
    II. Few firms
    III. Interdependence among firms
    (A) I only
    (B) II only
    (C) III only
    (D) II and III only
    (E) I, II and III

35. In the long run, a monopolistically competitive firm will make

(A) more economic profit than a perfectly competitive firm.

(B) less economic profit than a perfectly competitive firm.

(C) more economic profit than a monopoly.

(D) more economic profit than an oligopolist.

(E) zero economic profit.

36. If all of the firms in an oligopoly could, without cost, form an industry-wide cartel to jointly maximize profits, the demand curve facing the cartel would be

(A) less elastic than the industry demand curve.

(B) the same as the industry demand curve.

(C) more elastic than the industry demand curve.

(D) perfectly inelastic.

(E) horizontal at the market-clearing price.

37. Characteristics of an oligopoly, which can be demonstrated by game theory, include which of the following?

I.   Collusion can increase oligopolists' profits.
II. Oligopolistic firms are interdependent.
III. Independent price decision making leads to lower returns.

(A) I only   (B) II only
(C) III only   (D) I and II only
(E) I, II and III

38. The shapes of the marginal product curve and the total product curve are best explained by the

(A) law of demand.

(B) law of supply.

(C) principle of diminishing marginal utility.

(D) least-cost rule.

(E) law of diminishing returns.

	Royal's Burgers and Fries	
	Concentrate on Fries	Concentrate on Burgers
Brewer's Fries and Burgers Concentrate on Fries	120, 85	150, 120
Concentrate on Burgers	65, 100	50, 80

Use the payoff matrix above and the information below to answer questions 39 and 40.

Two competing fast-food restaurants in a small town, Royal's Burgers and Fries and Brewer's Fries and Burgers, realize that each must consider the method of attracting customers that the other is using. The payoff matrix above illustrates the firms' possible strategies and the relative profits to each restaurant under each possible outcome. (The first number in each box represents the payoff to Brewer's.)

39. Based on the payoffs above, which of the following statements is true?

(A) Brewer's has a dominant strategy to concentrate on fries.

(B) Brewer's has a dominant strategy to concentrate on burgers.

(C) Royal's has a dominant strategy to concentrate on fries.

(D) Royal's has a dominant strategy to concentrate on burgers.

(E) Neither restaurant has a dominant strategy.

40. What is the Nash Equilibrium in this game?

(A) Both fast-food restaurants should choose to concentrate on fries.

(B) Both fast-food restaurants should choose to concentrate on burgers.

(C) Brewer's should choose to concentrate on fries, and Royal's should choose to concentrate on burgers.

(D) Brewer's should choose to concentrate on burgers, and Royal's should choose to concentrate on fries.

(E) There is no Nash Equilibrium in this game.

41. Which of the following is true of a cartel?

    (A) A cartel is a coalition of firms that seek to coordinate their decisions so all firms can earn a higher economic profit.

    (B) A cartel is a way for firms to earn more by playing their dominant strategies.

    (C) A cartel is considered stable.

    (D) A cartel seeks to maximize total revenue of its members.

    (E) A cartel sets price and output of its members in the same way that a price discriminating monopolist would.

42. Which of the following best characterizes the firms in an oligopoly industry?

    (A) Firms can easily enter the industry when profits are high.

    (B) There are more firms than in a monopolistically competitive industry.

    (C) They are independent.

    (D) They always collude to increase profits.

    (E) They use strategic decision making.

		Acme	
		Advertise	Don't Advertise
AAA	Advertise	Acme: 150 AAA: 150	Acme: −100 AAA: 400
	Don't Advertise	Acme: 400 AAA: −100	Acme: 0 AAA: 0

Use the payoff matrix above and the information below to answer questions 43, 44 and 45.

Acme and AAA are the two major firms in the industry. Each must decide whether to conduct a television advertising campaign. The returns from each firm's decision depend on the decision of the other. The profits resulting from each possible combination of the firms' decisions are given in the payoff matrix above.

43. If AAA advertises and Acme does not, Acme's profits will change by

    (A) −$100.   (B) $0.   (C) $150.

    (D) $300.   (E) $400.

44. If AAA advertises, Acme will

    (A) decide not to advertise because this is its dominant strategy.

    (B) advertise because this is its dominant strategy.

    (C) not have a dominant strategy.

    (D) lose money.

    (E) increase its profit by $400 if it advertises.

45. Which of the following statements is true?

    (A) If AAA advertises, Acme's dominant strategy is to advertise.

    (B) If Acme advertises, AAA's dominant strategy is NOT to advertise.

    (C) The two firms are in a prisoner's dilemma game.

    (D) The two firms would be better off to agree to save their money and NOT advertise.

    (E) A collusive agreement to advertise would benefit both firms.

Sample Short Free-Response Questions

*1. "A monopolist charges the highest price the market will bear, whereas a perfect competitor does not." Explain in detail why you agree or disagree with this statement. As part of your answer, be sure to describe how a monopolist determines the profit-maximizing price.

---

*2. A single airline provides service from City A to City B.

    (A) Explain how the airline will determine the number of passengers it will carry and the price it will charge.

    (B) Suppose fixed costs for this airline increase. How will this increase in fixed costs affect the airline's price and output decisions in the short run?

*3. Assume that Star Inc. is a monopoly. Explain each of the following for this firm.

    (A) Why marginal revenue and demand are not equal

    (B) How the profit-maximizing level of output and the price are determined in the short run

    (C) Why economic profits continue to exist in the long run

---

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4. What is the long-run equilibrium condition for a perfectly competitive firm? Is the long-run equilibrium condition of a perfect competitor allocatively and / or technically (productively) efficient? Why or why not?

5. Why do oligopolists prefer to use nonprice competition rather than price competition?

6. What is the long-run equilibrium position for a monopolistically competitive firm? How does the long-run equilibrium position of a monopolistically competitive firm compare with the long-run equilibrium position of a perfectly competitive firm?

7. Why will a firm maximize profits where marginal revenue equals marginal cost? Under what conditions, if any, will a firm not operate where marginal revenue equals marginal cost? Explain.

8. Consider two firms in a market. Each firm must decide whether to market a new product. The profit earned from marketing the new product depends on whether one or both firms market the product. If one firm markets the product, the firm will earn a profit of $2 million. If both firms market the product, they split the profits of $3 million.

   (A) Identify the players, actions and payoffs in this game and construct a payoff matrix. Call the firms A and B. The first number in each square should represent the payoff for Firm A.

   (B) Does Firm A have a dominant strategy in this game? If so, what is it?

   (C) Does Firm B have a dominant strategy in this game? If so, what is it?

9. A firm is operating in a perfectly competitive market where price is equal to average variable cost in the short run.

    (A) Draw and correctly label a graph for this firm, indicating each of the following:
        (i)   Marginal revenue
        (ii) Average variable cost
        (iii) Average cost
        (iv) Marginal cost
        (v) Price

    (B) Describe the profit situation for the firm.

    (C) If industry price decreases, explain in the short run how this will affect the firm shown in your graph.

*10. Assume that in a perfectly competitive market, a firm's costs and revenue are

Marginal cost = average variable cost at $20

Marginal cost = average total cost at $30

Marginal cost = average revenue at $25

(A) How will this firm determine the profit-maximizing level of output?

(B) What price will this firm charge? Explain how the firm determined this price.

(C) Should this firm produce in the short run? Why or why not?

(D) Will this firm earn a profit or incur a loss? Why?

---

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Sample Long Free-Response Questions

*1. In a particular product market, there is only one seller and there are significant barriers to entry.

    (A) Explain how this firm determines its equilibrium output and price.

    (B) Explain whether this firm is producing the economically efficient level of output. In your answer include a brief definition of economic efficiency.

---

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*2. Assume that initially, a perfectly competitive industry is in long-run equilibrium.

(A) For the typical profit-maximizing firm in this industry, explain the following:
  (i) How the firm determines its level of output
  (ii) What the level of profit is and why it is at this level

(B) A change occurs that reduces the variable costs of production for all firms in this industry.
Explain how and why this decrease in variable costs affects each of the following in the short run:
  (i) The typical firm's level of output
  (ii) The industry price and level of output

---

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*3. A retail industry is perfectly competitive and in long-run equilibrium.

    (A) The wholesale price increases. Explain what happens initially to the retail industry's output and price.

    (B) In reaction to the changes above, the government imposes a retail price ceiling on the product at its original price level. What will be the effect of the price ceiling on the quantity demanded and supplied in the retail industry?

    (C) Given the effect of the price ceiling on the typical firm's profits, will firms in the retail industry have an incentive to enter or exit this industry in the long run? Explain.

---

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*4. A perfectly competitive manufacturing industry is in long-run equilibrium. Energy is an important variable input in the production process, and therefore the price of energy is a variable cost. The price of energy decreases for all firms in the industry.

(A) Explain how and why the decrease in this input price will affect this manufacturing industry's output and price in the short run.

(B) What will be the short-run effect on price, output and profit of a typical firm in this manufacturing industry? Explain.

(C) Will firms enter or exit this manufacturing industry in the long run? Why?

---

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*5. Peaches and nectarines are substitute goods, and both are produced under conditions of competitive long-run equilibrium.

(A) Joyce, a producer in the peach industry, discovers a technological breakthrough that reduced only the cost of producing peaches. Explain how the change in technology will affect each of the following for Joyce.
  (i)   Quantity of peaches produced
  (ii) The price of peaches
  (iii) Short-run profits

(B) Now assume that all other peach-producing firms adopt the new technology. Explain how the adoption of the new technology will affect each of the following in the peach-producing industry.
  (i) The price of peaches
  (ii) Quantity of peaches produced

(C) This new technology is not applicable to the production of nectarines. Explain how the changes that occurred in the peach industry will affect each of the following in the nectarine industry.
  (i) The price of nectarines
  (ii) Quantity of nectarines

---

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*6. In the country of Lola, sugar had always been produced in a perfectly competitive industry until a dictator seized power and monopolized the production of sugar.

(A) Draw a graph that shows the output and price the monopolist would choose to maximize profits.

The people of Lola revolt, imprison the dictator and repeal the law restricting the number of sellers of sugar.

(B) Explain two conditions that might lead to an increase in the number of sugar sellers after the repeal of the law.

(C) Describe how an individual seller would determine the profit-maximizing output level of sugar if the sugar industry were perfectly competitive.

(D) Given your answers in Parts (A) and (C), is the repeal of the law likely to make the sugar industry more efficient? In your explanation, be sure to include an explanation of economic efficiency.

---

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■ Firms are sellers in product markets and buyers in factor (resource) markets.

■ The demand for any resource is derived from the demand for the products that the resource can produce. Thus, resource demand depends on the price of the good or service that the resource produces and on the resource's productivity in producing the good or service.

■ The demand curve for a resource in the short run is downward sloping because the marginal physical product (MPP) of additional inputs of a resource will decrease as a result of the law of diminishing marginal returns. In some textbooks, marginal physical product is called marginal product.

■ The resource demand curve for a firm selling in an imperfectly competitive market will be steeper than the resource demand curve for a firm selling in a perfectly competitive market. The steeper slope results from both a decrease in the marginal physical product and a decrease in the product price required to permit the firm to sell a larger output.

■ A firm will continue to hire factors of production as long as its marginal revenue product (MRP) exceeds its marginal resource cost (MRC). A firm will not hire resources once MRC exceeds MRP.

■ A firm maximizes profits where a factor's marginal revenue product equals the factor's marginal resource cost. A firm maximizes profit where MRP = MRC.

■ In a perfectly competitive labor market, a firm will hire workers until the last worker's wage (MRC) equals the marginal revenue product of that last worker hired.

■ When a combination of resources is employed in producing a good or service, the profit-maximizing rule is

$$\frac{MRP_a}{MRC_a} = \frac{MRP_b}{MRC_b} = \frac{MRP_n}{MRC_n} = 1$$

■ When a firm produces the profit-maximizing level of output, it must utilize a least-cost combination of resources. The rule for a least-cost combination of resources is

$$\frac{MPP_a}{MRC_a} = \frac{MPP_b}{MRC_b} = \frac{MPP_n}{MRC_n}$$

■ For a firm facing a perfectly competitive resource market, resource supply is perfectly elastic and equal to marginal resource cost at a market-determined price (wage) for the resource. Under monopsony or imperfect conditions of employment, both resource supply and marginal resource cost are positively sloped curves with the marginal resource cost being a value greater than the price (wage) for all units beyond the first unit of the resource employed.

■ Given a downward-sloping marginal revenue product curve and the differences existing between supply and marginal resource cost in perfect competition and monopsony, a monopsonistic employer will pay a lower price (wage) and hire fewer units of a resource than a perfect competitor.

■ Economic rent is any payment to the supplier of a resource that is greater than the minimum amount required to employ the desired quantity of the resource to be supplied.

■ The equilibrium real interest rate influences the level of investment and helps allocate financial and physical capital to specific firms and industries.

■ Profits are the return to entrepreneurs for assuming risk and for organizing and directing economic resources.

■ Profits allocate resources according to the demands of consumers.

Jimmy D. Lee, Highland Park High School, Dallas, Texas, contributed to these Key Ideas.

"As the 'Circular Flow' Turns"

Unit 4 turns from the study of product markets to factor markets. Instead of determining the equilibrium output prices and quantities of final goods and services, we will determine the prices and quantities of the inputs necessary for production.

The roles of households as buyers and firms as sellers are now reversed. In the factor market, households supply: They supply their labor, capital and natural resources in factor markets. Firms demand inputs in markets that can be either *perfectly competitive*, meaning their prices (wages, interest, rent) are determined by the industry and taken by the firm, or *monopsonistic*, meaning there is only one buyer of the input and this buyer seeks the most profitable price at which to buy.

Part A

1. The circular flow diagram in Figure 43.1 provides a visual representation of economic activity between product and factor markets. Study the diagram and then fill in the table on the top of the next page by determining
    ■ whether the activity takes place in the product or factor *market*.
    ■ what the *role* of the participant is in terms of supply or demand.
    ■ whether the *price* is a product price, a wage, interest or rent.

✳ Figure 43.1
The Circular Flow of Resources, Households, and Government
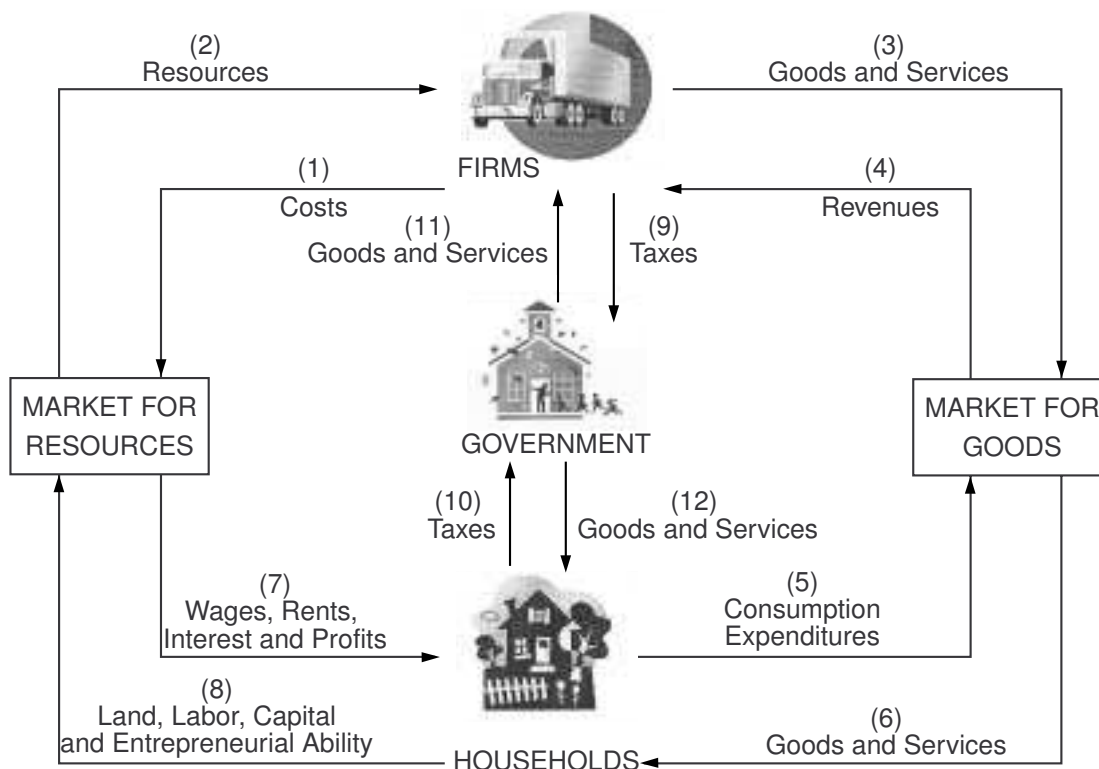
Activity	Market	Role	Price
Cashier at work			
A student buying a hamburger			
A business paying rent			
A firm hiring workers			
A firm selling T-shirts			

Part B

The circular flow also demonstrates the inter-relatedness of the two markets. If input costs (for example, wages and rent) change in the factor market, then the prices of goods and services will also change. Additionally, if prices in the output market change because of changes in supply of or demand for the product, the factor market will be affected.

In the following examples, determine which market (product or factor) is affected first and then determine how the other market is affected subsequently.

2. A study announces increased cancer risk from drinking coffee.

Primary market		Other market	
Affects supply or demand		Affects supply or demand	
Influence on price (increase / decrease)		Influence on price (increase / decrease)	

3. There is an increase in the number of people looking for work.

Primary market		Other market	
Affects supply or demand		Affects supply or demand	
Influence on price (increase / decrease)		Influence on price (increase / decrease)	

4. Price in the labor market is called a _____ .

Because of the nature of the circular flow, it is important to remember that focusing on product markets without considering the impact on factor markets (and vice versa) is impossible.

How Many Workers Should Be Hired?

You are the president of Acme Yo-Yo Company, a small manufacturing firm that produces Supersonic Yo-Yos, a popular toy that makes a "supersonic" noise when used.

Acme's yo-yos are manufactured by yo-yo makers working at two yo-yo-making machines. You have been estimating how many yo-yos your company can make using different numbers of workers, and you now have to decide just how many workers Acme will hire.

Your study of your yo-yo-making process has shown that you can produce the following number of yo-yos per day depending upon how many workers you hire.

✳ Figure 44.1
Workers Hired and Yo-Yos Produced Per Day

Number of Workers Hired	Number of Yo-Yos Produced Each Day	Change in Number of Yo-Yos Produced
1	20	20
2	50	30
3	70	20
4	85	15
5	95	10
6	100	5

After the second worker is hired, hiring more workers still increases the number of yo-yos produced, but the extra number of yo-yos produced gets smaller and smaller as more workers are hired.

You have also learned that the market for Acme's yo-yos is such that Acme can sell as many yo-yos as it wants every day for $2 each and that you can hire as many qualified yo-yo makers as you need by paying each one $30 per day.

Figure 44.2 can help you decide how many workers to hire. You can find out how many workers should be hired by comparing the *additional* revenue from hiring each worker (this is called the *marginal revenue product of labor*) with the *cost* of hiring the additional worker, which in this case is always $30 a day. (The worker wage is called *marginal resource cost.*)

Here is how you do this: First you need to calculate the *marginal physical product* (sometimes referred to as the *marginal product*), which is the *additional* output created by one more worker. You can do this by comparing the level of output with the additional worker to the level of output with *one less* worker.

Next you need to calculate how much revenue Acme will generate when it hires workers. Then you will have to calculate how much *additional* revenue Acme earns by hiring one more worker. You can do this by comparing total revenue at one level of input with total revenue at the next-lowest level of output.

✳ Figure 44.2
How Many Workers to Hire per Day for $2 Yo-Yos

Number of Workers Hired (inputs)	Level of Output (number of yo-yos produced per day) (Q)	Marginal Physical Product (MPP)	Price at Which Yo-yos Can Be Sold	Total Revenue (P x Q)	Marginal Revenue Product (MPP x MR)
0	0	—	$2.00	$0	—
1	20	20	2.00	40 = 2 x 20	$40
2	50		2.00		
3	70		2.00		
4	85		2.00		
5	95		2.00		
6	100		2.00		

1. Why does the number of extra yo-yos produced decrease as more workers are hired?

2. If the wage is $30 per day, how many workers should Acme hire? Why?

3. If the demand for yo-yos increases so that Acme can sell as many yo-yos as it wants for $3 each, what effect will this have on Acme's level of employment?

4. To make as much profit as possible, in this case a firm should hire an additional worker as long as that worker's _____ is greater than his or her _____ .

The Derived Demand for a Resource

The key to understanding resource prices in factor markets is to see the relationship between demand in the factor market and demand in the product market. You should review the definitions of marginal physical product (MPP), marginal revenue (MR) and marginal revenue product (MRP).

   The demand for a resource (land, labor, capital or entrepreneurship) is called *derived demand* because it is derived (comes) from the demand for the goods and services that are produced by these resources.

1. Complete Figure 45.1. The yo-yo manufacturer operates in a perfectly competitive factor market and in a perfectly competitive product market. In a perfectly competitive factor market, market supply and demand determine the price of the factors of production. In a perfectly competitive product market, supply and demand determine the price of the product.

✳ Figure 45.1
Data for a Yo-Yo Manufacturer

Units of Resource	Total Product	Marginal Physical Product (MPP)	Price at Which Yo-Yos Can Be Sold	Total Revenue (P x Q)	Marginal Revenue Product (MPP x MR)
0	0	—	$2.00	$0	—
1	8	8	2.00	16	$16
2	14	6	2.00	28	12
3	19		2.00		
4	23		2.00		
5	26		2.00		
6	28		2.00		
7	29		2.00		

   The marginal revenue product (MRP) shows the additional revenue the firm will receive from the additional output produced by adding another unit of the factor/resource. This can be calculated as ΔTR / ΔResource or MPP x P. This is the firm's demand curve for the resource.

2. Use the answers in the last column of Figure 45.1 to graph marginal revenue product on Figure 45.2. Label the MRP curve MRP = D. Plot each number on the line, not at the midpoint.

✳ Figure 45.2

Price and Quantity for a Resource
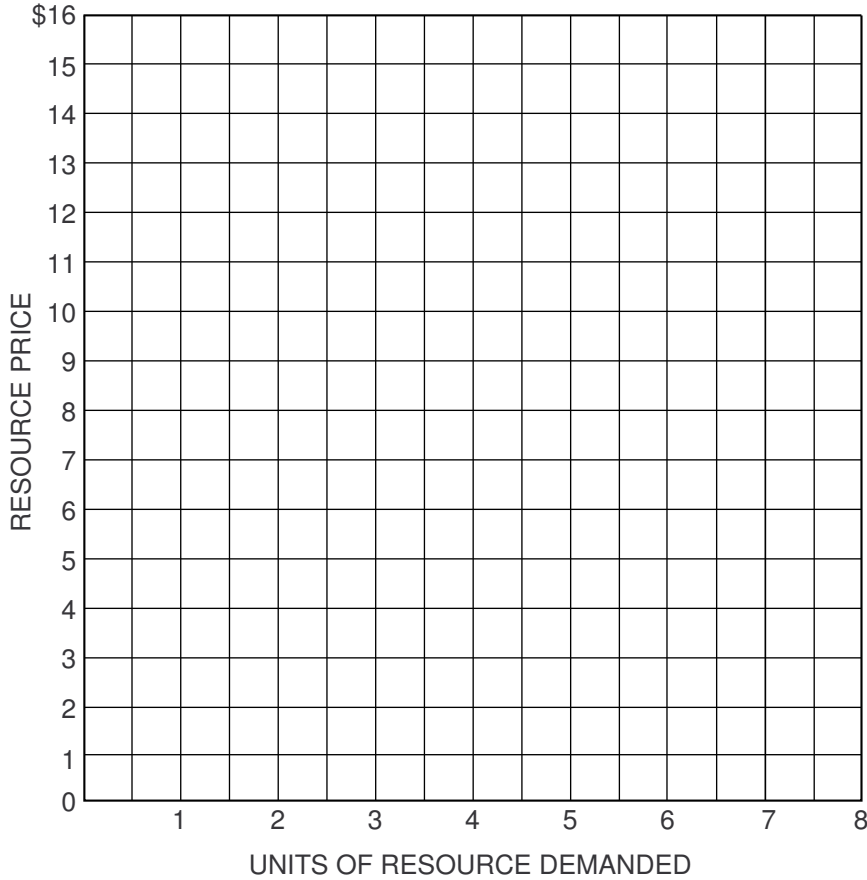
3. MRP depends on two variables. One is marginal physical product (MPP), sometimes referred to as *marginal product*. The second variable is the price of the good or service being produced. For each of the following situations, identify whether MPP of the factor or P of the product is affected and indicate whether the demand for a resource would increase or decrease.

Situation	Marginal Physical Product	Price	Demand for labor (inc. / dec.)
(A) A new yo-yo machine increases productivity of labor			
(B) The price of yo-yos increases			
(C) Better training increases the output of yo-yo labor			
(D) The demand for yo-yos increases			
(E) New technology increases the output of yo-yo labor			
(F) Consumers become sick of yo-yos			

The Only (Yo-Yo) Game in Town

✳ Figure 46.1
Daily Price and Demand for Yo-Yos
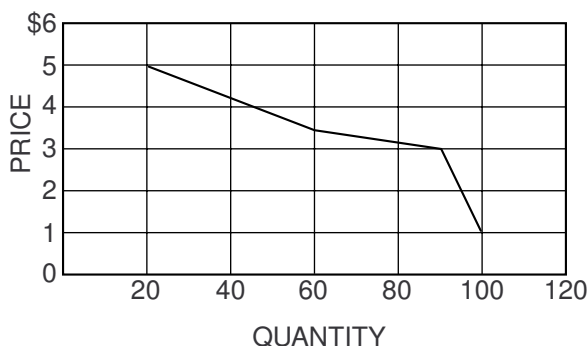
Instead of being able to sell as many yo-yos as it wants at $2 each, suppose that Acme Yo-Yo Company is a monopolist. This means Acme has no direct competition in selling yo-yos (although Acme will face competition from other kinds of toys and games). Acme finds that as a result of its monopolistic position, it can charge a price higher than $2 if it wants to cut back its production. Acme will, however, have to lower its price to sell additional yo-yos.

What effect will this have on Acme's demand for labor? You can figure this out by using the same procedure you followed when the price stayed constant at $2. You will have to calculate how much additional revenue will be brought in by hiring one more worker and comparing this extra revenue with the extra cost of hiring the worker (i.e., the wage rate).

You can use the same table you used before, except that now the price changes if more yo-yos are sold.

✳ Figure 46.2
How Many Workers to Hire per Day for Varying Prices of Yo-Yos

| Number of Workers Hired (inputs)	Level of Output (number of yo-yos produced per day) (Q)	Marginal Physical Product (MPP)	Price at Which Yo-yos Can Be Sold	Total Revenue (P x Q)	Marginal Revenue Product (change in TR from previous level)
0	0	—	$0.00	$0	—
1	20	20	5.00	$100 = $5 x 20	$100
2	50		4.00		
3	70		3.50		
4	85		3.00		
5	95		2.00		
6	100		1.00		

From *Student Activities to Accompany The People on Market Street Series,* Indiana Council on Economic Education, Purdue Research Foundation, 1983

1. How is Acme's demand schedule for labor different now from when it sold all its product for $2 each?

2. Acme's decision-making rule is the same: If an additional worker adds more to revenue than cost, this worker should be hired. If Acme can still hire workers at $30 per day, how many workers should Acme hire? Why?

3. How does the number of workers the monopolist hires differ from the number in Activity 45?

Factor Market Pricing

Suppose that the Acme Belt Company (ABC) is a price taker in both the input and output markets—that is, it sells belts in a perfectly competitive market and purchases labor in a perfectly competitive market.

Part A

1. Fill in the blank spaces in Figure 47.1. Note that marginal data are placed between levels of employment.

✳ Figure 47.1
Labor Demand for the Perfectly Competitive Firm

Employment Number of Workers (L)	Total Output Per Day (Q)	Marginal Physical Product (MPP) ($\Delta Q / \Delta L$)	Marginal Revenue Product (MPP $\times$ P) $P_B = \$2.00$	$P_B = \$2.50$
0	0		—	—
1	10	10	$20.00	
2	30	20	40.00	
3	70	40		100.00
4	105		70.00	
5	135	30	60.00	
6	160	25		62.50
7	180		40.00	50.00
8	195	15		
9	205	10	20.00	
10	205			0
11	195	−10		

An individual firm's factor demand curve is restricted to a range of the MRP_L curve that is downward sloping, beginning at L = 3 for ABC.

2. If the marginal resource cost, or wage, faced by ABC is $20 and the price of belts is $2 per belt, then the quantity of labor demanded by ABC is _____ .

3. If the marginal resource cost, or wage, faced by ABC is $20 and the price of belts is $2.50 per belt, then the quantity of labor demanded by ABC is _____ .

Activity written by Kelly A. Chaston, Davidson College, Davidson, N.C.

Part B

Now suppose that ABC is one of 1,000 identical firms that purchase labor in this perfectly competitive labor market. To get the market demand curve for labor, we need to sum over each individual firm's MRP_L curve at each given wage. Given our assumption that the firms are identical, we can simply multiply the quantity of labor demanded by a single firm by the number of firms in the market. In Figure 47.2, data are for P = $2.00 and P = $2.50.

Figure 47.2
The Labor Market

	P = $2.00				P = $2.50		
Wage	Number of Workers Demanded By Firm ABC (P_b = $2)	Number of Workers Demanded In the Market (P_b = $2)	Number of Workers Supplied	Wage	Number of Workers Demanded By Firm ABC (P_b = $2.50)	Number of Workers Demanded In the Market (P_b = $2.50)	Number of Workers Supplied
$20	9	9,000	3,000	$25.00	9	9,000	3,500
30	8	8,000	4,000	37.50	8	8,000	4,750
40	7	7,000	5,000	50.00	7	7,000	6,000
50	6	6,000	6,000	55.00	6.5	6,500	6,500
60	5	5,000	7,000	62.50	6	6,000	7,250
70	4	4,000	8,000	75.00	5	5,000	8,500
80	3	3,000	9,000	87.50	4	4,000	9,750
				100.00	3	3,000	11,000

4. If the wage is $20 and the price of belts is $2 per belt, then the quantity of labor demanded in the market is 1,000 x _____ = _____ units of labor.

Figure 47.3 shows the market labor supply curve as well as the firm and market demand curves when P_B = \$2. The supply curve shows that, *ceteris paribus*, as the wage increases, more workers are willing to supply their labor to this market, and existing workers in this market are willing to supply more labor.

✳ Figure 47.3
Market and Firm Demand for Labor
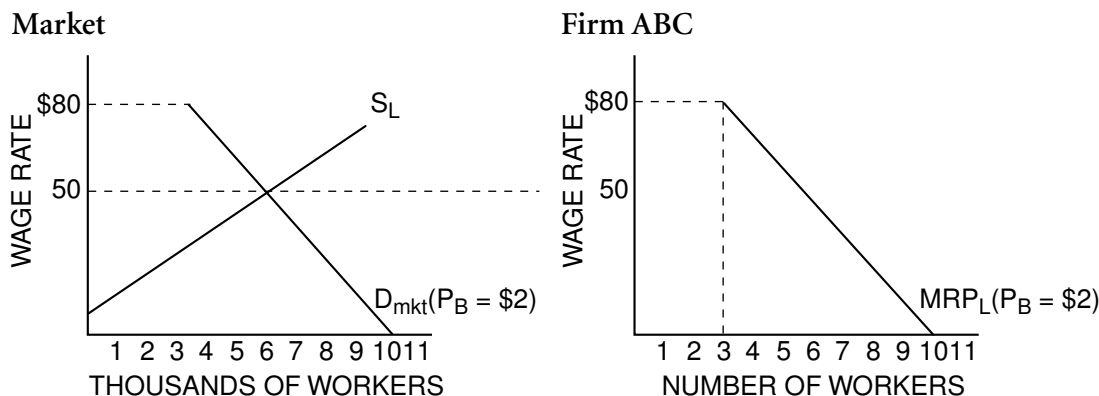
5. On the graphs in Figure 47.3 and the table in Figure 47.2, the equilibrium wage in the market is _____ . The equilibrium quantity of labor in this market is _____ workers.

6. Given that this is a competitive labor market, ABC faces a marginal resource cost, or wage, of _____ .

7. Because ABC can purchase as much or as little labor as it wants without affecting the market, it is said to face a perfectly elastic labor supply curve. Draw the labor supply faced by the firm in the *Firm ABC* graph above.

8. Using a different color pen or pencil, graph ABC's and the market's labor demand curves in Figure 47.3, given that the price of a belt has increased to \$2.50.

9. Designate the new market equilibrium based on Figure 47.2. The equilibrium wage in the market is now _____ . The equilibrium quantity of labor in this market is now _____ workers.

10. What has happened to the labor supply curve faced by the firm?

How Wages Are Determined in Competitive Labor Markets

✳ Figure 48.1
Wages and Labor
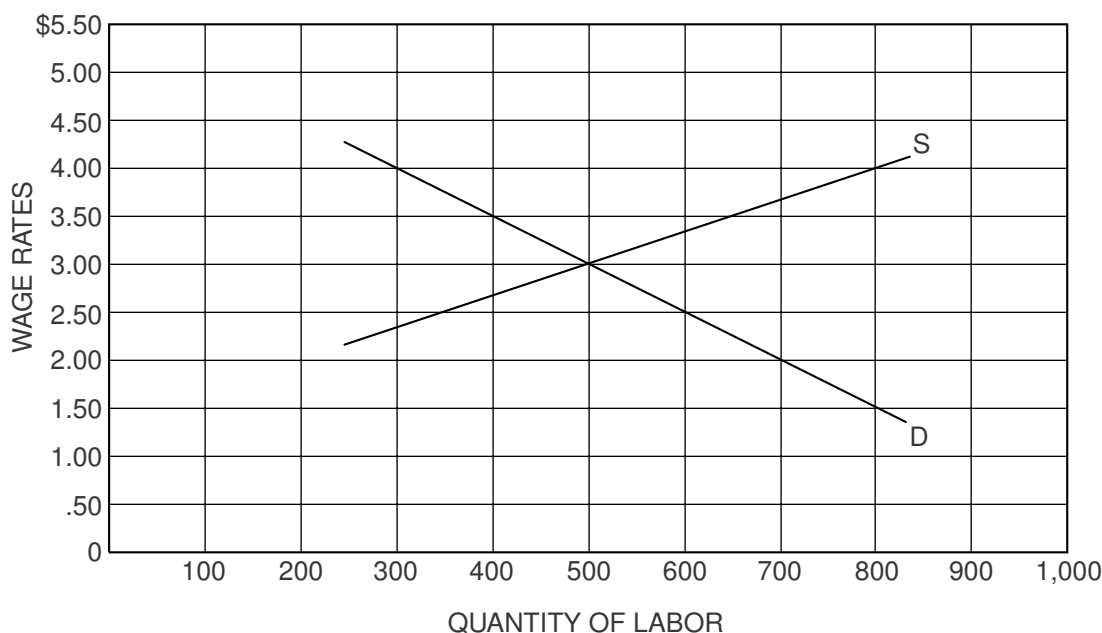
Use Figure 48.1, which shows the supply and demand curves for a perfectly competitive labor market in a perfectly competitive product market, to answer these questions:

1. What two factors affect the demand for labor?

2. How does marginal revenue product affect the demand for labor?

3. Why is the demand curve for labor downward sloping?

Adapted from Robert W. Pulsinelli and Roger LeRoy Miller, *Student Learning Guide to Accompany Economics Today,* 8th edition (New York: HarperCollins College Publishers, 1994).

4. What determines the market supply of labor?

5. Why is the market supply curve for labor upward sloping?

6. What is the equilibrium wage in this labor market? _____

7. How many workers will be hired in this labor market? _____

8. If a minimum-wage law raises the minimum wage to $4.00 an hour, what quantity of labor will be supplied? _____

9. At a minimum wage of $4.00 an hour, what quantity of labor will be demanded? _____

10. How many workers would be laid off or would lose their jobs because of this minimum wage? _____

11. How many workers entered the labor force seeking a job because of this minimum wage? _____

12. If the demand for labor were more inelastic, would more or fewer workers lose their jobs because of this minimum wage? _____

13. Would skilled or unskilled workers be more likely to lose their jobs because of a minimum-wage law?_____

14. Who benefits from the minimum wage?

15. Who is hurt by the minimum wage?

16. Do you favor a higher minimum wage? Why or why not?

The Effects of Unions on Wages and Employment in Competitive and Monopsonistic Labor Markets

Assume two labor markets: Market 1 is competitive, and Market 2 is monopsonistic. Assume each market is in an initial equilibrium illustrated by the graphs. Assume further that a union exists in each of the markets.

For each scenario below, you have been given the market supply and demand curves for a labor market before a union is formed. For each scenario and each market, identify how the actions of the union affect the supply and demand curves. Then indicate whether, as a result of these actions, the wage rate and level of employment will be higher, lower or indeterminant.

SCENARIO 1: The union is successful in requiring that new teachers pass a state competency test to be employed.

✳ Figure 49.1
Competency Test Required

Competitive
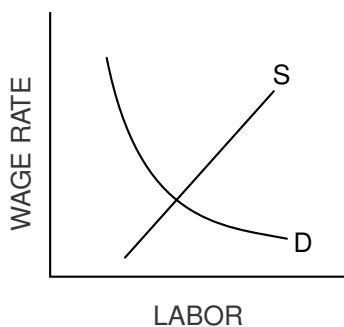
Wage Rate   _____
Employment   _____

Monopsonistic
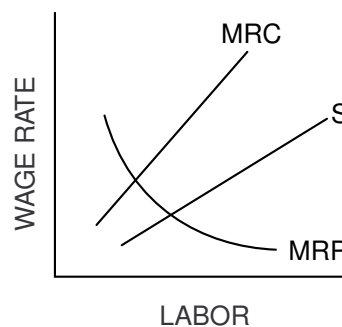
Wage Rate   _____
Employment   _____

Activity written by Francis McMann, Washington High School, Cedar Rapids, Iowa, and David Stark, Brainerd High School, Brainerd, Minn.

SCENARIO 2: The labor union conducts a successful national advertising campaign urging people to buy union-made goods.

✳ Figure 49.2
National Advertising Campaign

Competitive   Monopsonistic
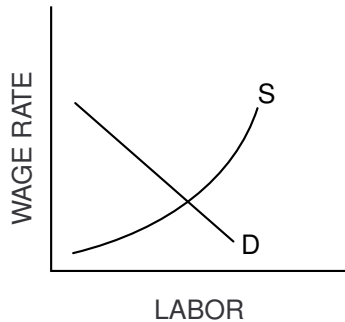
Wage Rate   _____   Wage Rate   _____
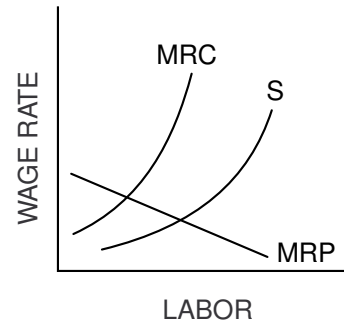
Employment   _____   Employment   _____

SCENARIO 3: The labor union educates workers in new methods of production, which leads to increased productivity.

✳ Figure 49.3
Increased Productivity

Competitive   Monopsonistic
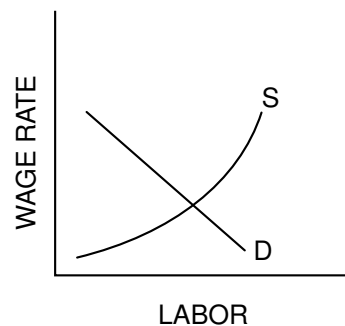
Wage Rate   _____   Wage Rate   _____
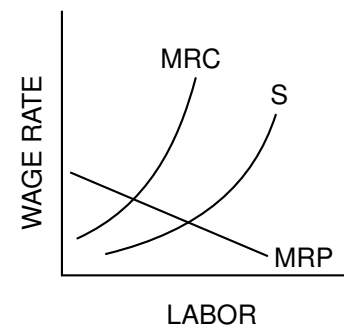
Employment   _____   Employment   _____

SCENARIO 4: The labor union promotes national legislation to increase quotas and/or tariffs on foreign competitors.

✳ Figure 49.4
Quotas/Tariffs on Foreign Competition

Competitive   Monopsonistic
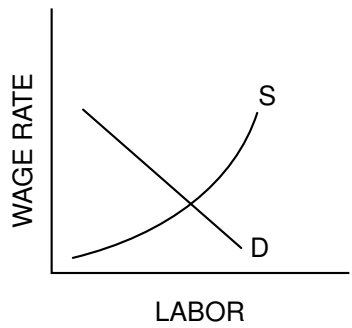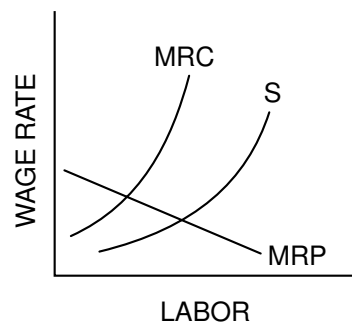
| Wage Rate _____ | Wage Rate _____ |
| Employment _____ | Employment _____ |

SCENARIO 5: The labor union bargains for and wins an increase in the wage rate above the equilibrium wage rate.

✳ Figure 49.5
Wage Increase Above Equilibrium Rate

Competitive   Monopsonistic
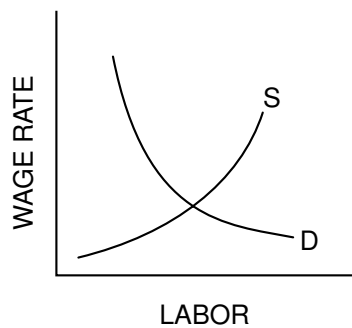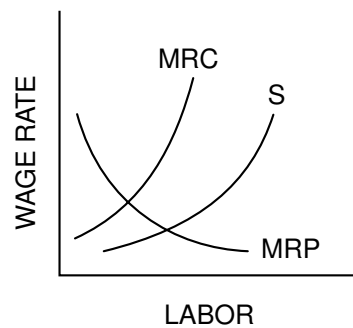
| Wage Rate _____ | Wage Rate _____ |
| Employment _____ | Employment _____ |

SCENARIO 6: The labor union signs an agreement with employers that forces employers to hire only union members who have gone through the union's apprenticeship program.

✳ Figure 49.6
Only Union Members Hired

Competitive
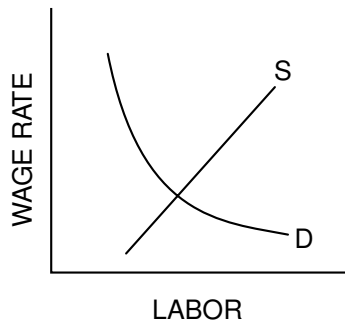
Wage Rate _____
Employment _____

Monopsonistic
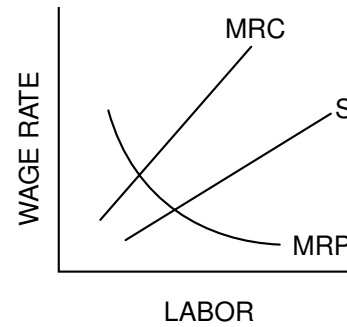
Wage Rate _____
Employment _____

The Story of Economic Rent: What Do Land, Athletics and Government Have in Common?

Economic rent is defined as a return over and above opportunity cost or the "normal" return necessary to keep a resource in its current use. Economic rent is any payment made to a resource above the amount necessary to induce any amount of the resource to be employed. Economic rent can also be defined as the amount over and above the opportunity cost necessary to keep the resource in its current use.

Part A

1. Assume that the quantity of a certain type of available land is 300,000 acres and the demand for this land is the data given in Figure 50.1.

Figure 50.1

Demand for Land at Varying Prices

Pure Land Rent Per Acre	Acres of Land Demanded
$350	100,000
300	200,000
250	300,000
200	400,000
150	500,000
100	600,000
50	700,000

(A) Plot on Figure 50.2 the supply and demand curves for this land.

(B) The pure rent per acre on this land will be _____ .

(C) The total quantity of land rented will be _____ acres.

(D) If landowners were taxed at a rate of $250 per acre for their land, the pure rent on this land after taxes would be _____ , but the number of acres rented would be _____ .

Figure 50.2

Plotting Demand Curves for Land

LAND RENT (vertical axis): $350, 300, 250, 200, 150, 100, 50, 0

NUMBER OF ACRES (horizontal axis): 100,000 200,000 300,000 400,000 500,000 600,000 700,000
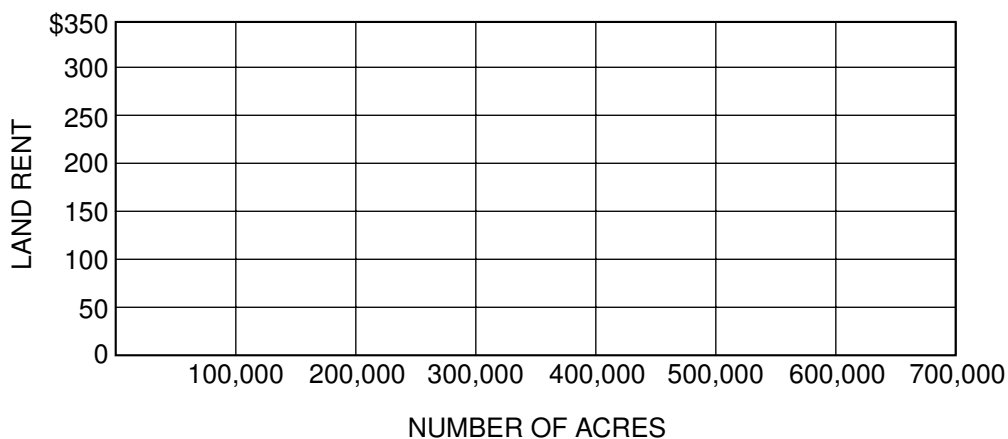
Parts of this activity were adapted from Phillip Saunders, *Introduction to Microeconomics: Student Workbook,* 18th ed. (Bloomington, Ind., 1998) and William Walstad and Robert Bingham, *Study Guide to Accompany McConnell and Brue Economics* (New York: McGraw-Hill, 1993).

2. Figure 50.3 gives the yields, or output per acre, in bushels on three grades of land resulting from varied amounts of expenditure on workers, fertilizer, etc. (Use only these data; don't try to estimate what would happen if other amounts are expended.) To answer the questions below, apply your marginal-analysis skills to the data in the table.

Figure 50.3
Yield per Acre on Three Grades of Land

Land Quality	$0	$100	$200	$300	$400	$500	$600
			Expenditure per Acre				
Grade A Land	0	175	325	450	525	575	615
Grade B Land	0	160	290	375	445	490	525
Grade C Land	0	120	210	290	330	360	385

(A) If the product sells for $1.00 a bushel, how many dollars per acre should be spent on

Grade A land? _____   Grade B land? _____   Grade C land? _____

(B) In a competitive market, what do you think the rental price would be for an acre of:

Grade A land? _____   Grade B land? _____   Grade C land? _____

(*Note: Economic rent is defined as a return over and above opportunity cost of the "normal" return necessary to keep a resource in its current use. Using this logic, you can approach Question 2(B) by asking: "What is the most someone would be willing to pay for the right to use an acre of each type of land?"*)

Part B

Land is not the only resource with a fixed supply. For example, the supply of a star athlete is fixed. Suppose Tiger Woods earns $50 million a year.

3. Assume that Tiger Woods' next-best option after playing golf is to work as a high school teacher and coach. He could earn $50,000 a year in this job. How much economic rent is involved in Tiger's salary as a golfer? _____

4. Now assume that someone else is as good at soccer as Tiger Woods is at golf. If this person wanted to play soccer in the United States, would this player receive more or less economic rent than Tiger does for playing golf? Support your answer.

Problems Dealing with Factor Markets

Part A

Answer the questions and briefly explain your answers. Feel free to use diagrams to illustrate your points.

1. Why are some basketball players paid more than brain surgeons? Explain using the concept of marginal revenue product.

2. True, false or uncertain, and explain why? "If it were not for unions pushing up wages, we'd all be working 60 hours a week for $100 a month just like people did a century ago."

3. Use a graph to explain why firms that want to maximize their profits use a resource until the marginal revenue product of this resource equals the marginal resource cost.

4. True, false or uncertain, and explain why? "American workers who are paid $10 an hour cannot possibly compete with workers who are paid $1 an hour in developing countries."

5. Why might a university pay a Nobel Prize-winning faculty member more than its president? Does this make sense economically for the university? Support your answer.

6. What are the effects of a minimum wage that is above the equilibrium wage in a perfectly competitive market? What about in a market in which the employer is a monopsonist? Give an example of a relatively competitive labor market and a less competitive labor market.

7. The National Collegiate Athletic Association (NCAA) regulates all college athletics in the United States. It sets the amount of scholarships, the number of scholarships granted and the regulations for recruiting athletes. The NCAA has hundreds of rules regulating intercollegiate athletics.

(A) What effect do these regulations have on who receives the economic rent from college athletics?

(B) Which colleges have greater incentives to cheat? Why?

(C) Who would gain if the NCAA could no longer set rules for college athletics? Why?

(D) Who would lose if the NCAA could no longer control college athletics? Why?

(E) True, false or uncertain, and why? "The NCAA is a champion for amateur athletics, and its rules protect the rights of college athletes."

Part B

Figure 51.1 gives you information about a firm operating in a competitive product market. Consider all factors of production fixed, with the exception of labor. The other factors of production cost the firm $50 a day, which may be thought of as a fixed cost. Assume the firm is a profit maximizer.

✳ Figure 51.1

Firm Operating in a Competitive Product Market

Labor Input (workers per day)	Total Physical Product (units per day)	Marginal Physical Product (units per day)	Marginal Revenue Product ($ per worker)
0	0		
1	22		
2	40		
3	56		
4	70		
5	82		
6	92		
7	100		
8	106		

   Fill in the answer blanks or underline the correct words in parentheses.

8. Assume the firm sells its output at $3 per unit. Complete the last two columns in the table.

   (A) If the equilibrium market wage is $36 per day, the firm will hire _____ workers per day and produce _____ units of output.

   (B) Given your answer to the preceding question, the firm will have total revenue of _____ per day and total cost of _____ per day.

   (C) The above will result in a *(profit / loss)* of _____ per day.

9. Suppose you work for a firm that sells its output in a monopoly market. Answer the following questions.

   (A) If you hire an additional worker, output goes up by 50 units to 125 units per day. If you want to sell the additional 50 units, you must lower your price from $3 per unit to $2 per unit. What is the wage you would be willing to pay the additional worker? _____

(B) Assume that you hired the additional worker and output now stands at 125 units per day. If you hire another worker, output rises to 165 units per day. Given the demand curve for your product, you know that to sell the additional output, price will have to be dropped from $2 per unit to $1 per unit. What is the maximum wage you would be willing to pay *this* additional worker? _____ Would you hire this additional worker? _____ Why or why not?

10. Use a graph to explain why "monopsonists will always hire fewer workers and pay lower wages than firms operating in competitive labor markets." (Assume that the monopsonistic and competitive firms have the same costs.)

Sample Multiple-Choice Questions

Circle the letter of each correct answer.

1. Derived demand is
   (A) demand for an input used to produce a product.
   (B) demand derived from the satisfaction of a buyer for the product.
   (C) caused by monopoly control of the inputs.
   (D) derived from government policy.
   (E) dependent on the demand for a substitute or a complementary input.

Use the following information to answer questions 2, 3 and 4.

Number of Chefs	Number of Pizzas That Can Be Made in an Hour
0	0
1	10
2	18
3	24
4	28
5	30
6	29

2. The law of diminishing marginal returns occurs after hiring which chef?
   (A) First   (B) Second   (C) Third
   (D) Fourth   (E) Fifth

3. The marginal productivity of the third chef is
   (A) 24 pizzas   (B) 18 pizzas   (C) 10 pizzas
   (D) 8 pizzas   (E) 6 pizzas

4. If the price per pizza is $10 and if each chef receives $20 an hour, how many chefs will the owner hire to maximize profits?
   (A) 2   (B) 3   (C) 4   (D) 5   (E) 6

5. Which of the following would determine the marginal revenue product of an input used in a perfectly competitive output market?
   I.   Dividing the change in total revenue by the change in the input
   II. Dividing the change in marginal revenue by the change in the output
   III. Multiplying the marginal revenue product by the marginal revenue of the output
   IV. Multiplying marginal revenue by the price of the output
   (A) I only   (B) II only
   (C) III only   (D) I and III only
   (E) II and IV only

6. Which of the following explains why the marginal revenue product of an input in a perfectly competitive market decreases as a firm increases the quantity of an input used?
   (A) The law of diminishing marginal returns
   (B) The law of diminishing marginal utility
   (C) The homogeneity of the product
   (D) The free mobility of resources
   (E) The total immobility of resources

7. A profit-maximizing firm should hire an input as long as the
   (A) firm can increase its total revenue.
   (B) price of the input doesn't exceed the price of the other inputs used in the firm's production.
   (C) marginal revenue product of the input is less than the cost of hiring the input.
   (D) marginal revenue product of the input is greater than the marginal revenue products of other inputs the firm is using.
   (E) marginal revenue product of the input is at least as much as the cost of hiring the input.

8. The demand for labor will decrease in response to which of the following?

(A) Increased productivity of labor

(B) Better training of all laborers

(C) A decrease in the supply of labor

(D) An increase in the supply of labor

(E) Decreased demand for goods and services produced by labor

9. A firm hiring inputs in a perfectly competitive market will hire up to the point where

(A) marginal physical product of the input is at a minimum.

(B) marginal physical product of the input is at a maximum.

(C) the price of the input equals the price of the output.

(D) the price of the input equals the marginal physical product of the input.

(E) the price of the input equals the marginal revenue product of the input.

10. A firm is a competitive seller of output at a market price of $3. The only resource it requires to create its product is labor, which it purchases competitively at a wage rate of $6 per hour. The last worker it employs increases total output from 36 to 40 units per hour. What is the marginal revenue product for this worker?

(A) $3   (B) $6   (C) $12

(D) $24   (E) $40

Use the following information to answer questions 11, 12 and 13.

Units of Workers	Total Product	Product Price
0	0	$3.80
1	10	$3.70
2	19	$3.60
3	27	$3.50
4	34	$3.40
5	40	$3.30

11. The marginal revenue product of the third worker is approximately equal to

(A) $21   (B) $26   (C) $28

(D) $30   (E) $35

12. Which of the following is true according to the information in the table?

(A) The firm is selling its product in a purely competitive market.

(B) The firm is selling its product in an imperfectly competitive market.

(C) There is no level of output at which this firm can earn a profit.

(D) The law of diminishing returns is not applicable to this firm.

(E) The firm is hiring its workers in an imperfectly competitive labor market.

13. If the wage rate is constant and equal to $21, how many workers will the profit-maximizing firm hire?

(A) 1   (B) 2   (C) 3

(D) 4   (E) 5

14. Which of the following will cause an increase in the demand for labor?

   I.   Increase in the price of the output
   II. Increase in worker productivity
   III. Increase in wages
   IV. Increase in the supply of workers

   (A) I only   (B) II only   (C) III only

   (D) I and II only   (E) III and IV only

15. A firm requires labor and capital to produce a given output. Labor costs $8 per hour, and capital costs $12 per hour. At the current output level, the marginal physical product of labor is 40 units, and the marginal physical product of capital is 60 units. To minimize its production costs at the current level of output, in which of the following ways should the firm change the amount of labor and capital?

Labor	Capital
(A) Increase	Increase
(B) Increase	Decrease
(C) Decrease	Increase
(D) Decrease	No Change
(E) No Change	No Change

16. In a competitive industry, suppose the marginal revenue product of the last donut baker hired is $35 and the marginal revenue product of the last bagel maker hired is $15. A bakery must pay donut bakers $40 a day and bagel makers $10 a day. Which of the following should the bakery hire to maximize profits?

   (A) More donut bakers and fewer bagel makers

   (B) Fewer donut bakers and more bagel makers

   (C) Fewer of both donut bakers and bagel makers

   (D) More of both donut bakers and bagel makers

   (E) Neither more nor fewer donut bakers or bagel makers

Use the graph below to answer questions 17, 18 and 19.
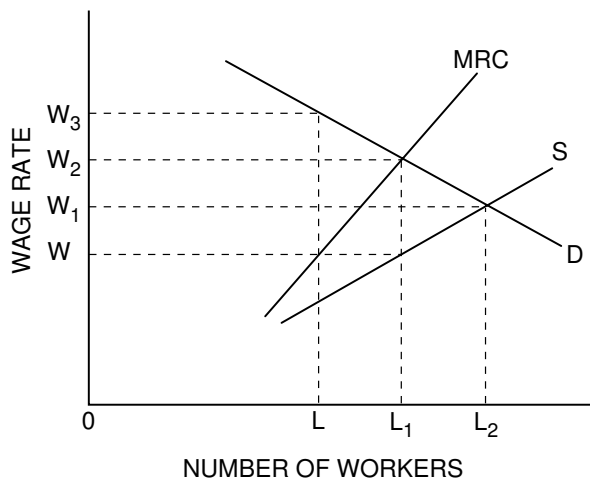
17. Under perfectly competitive conditions in the product and labor markets, the wage rate will be

   (A) W, and L_1 workers will be hired.

   (B) W_1, and L_1 workers will be hired.

   (C) W_2, and L_1 workers will be hired.

   (D) W_1, and L_2 workers will be hired.

   (E) W_3, and L_1 workers will be hired.

18. Now suppose that through an employers' association, firms in this industry establish a monopsony in the hiring of labor. In this case, the wage rate will be

   (A) W, and L_1 workers will be hired.

   (B) W_1, and L_1 workers will be hired.

   (C) W_2, and L_1 workers will be hired.

   (D) W_2, and L_2 workers will be hired.

   (E) W_3, and L workers will be hired.

19. Now assume that workers react to the forma-
tion of this monopsony by establishing an
inclusive union. To what level can this union
increase the wage rate without causing the
number of jobs to decline below that which the
monopsony would otherwise provide?

(A) W   (B) W_1 (C) W_2 (D) W_3

(E) Inclusive unions can never increase real
wages.

20. If the cost of labor, the only variable input, is
$20, and the marginal physical product of
labor is four units per hour, the marginal cost
of the first unit of output is

(A) $20.   (B) $16.   (C) $12.

(D) $10.   (E) $5.

21. Pure economic rent refers to the

(A) capital gains received from the sale of
property.

(B) payment to any resource over and above
what is required to keep the resource in
supply at its current level in the long run.

(C) difference between the return to owners of
land and the market rate of interest.

(D) implicit value of owner-occupied housing
in the long run.

(E) price paid for a resource that has a perfect-
ly elastic supply.

22. One reason why the supply of carpenters is
greater than the supply of physicians is that

(A) carpenters demand less income.

(B) physicians do not belong to a union.

(C) physicians must make a greater investment
in human capital.

(D) carpenters belong to unions.

(E) carpenters are in greater demand than are
doctors.
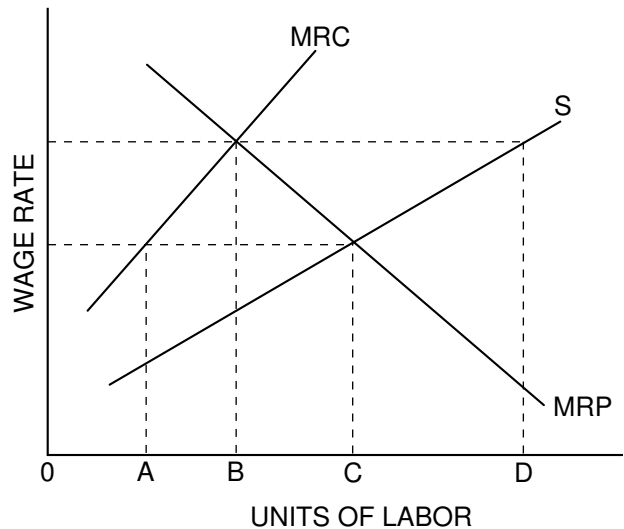
23. The level of employment in the monopsony
labor market shown above will be

(A) A.

(B) B.

(C) C.

(D) D.

(E) less than A.
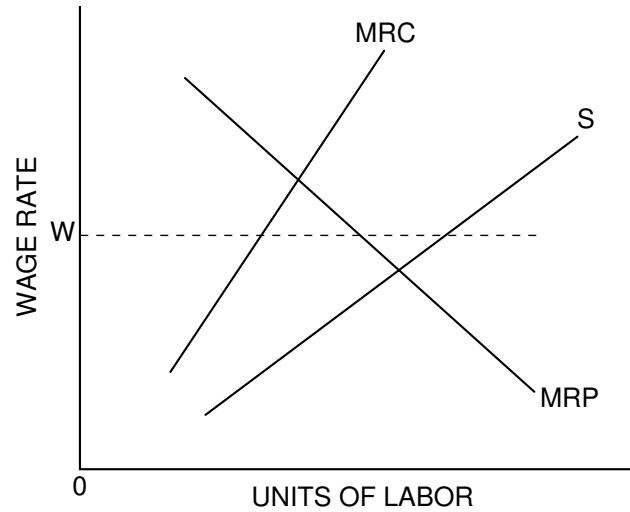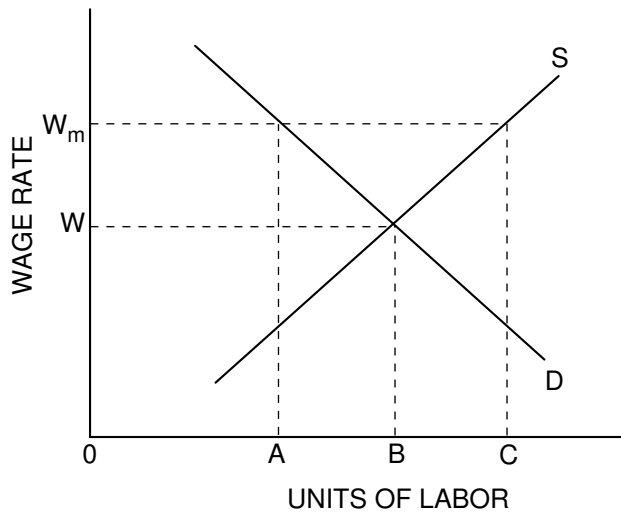
24. The labor market shown above is initially in equilibrium. If a minimum wage level is set at W_m, employment will

    (A) increase from A to B.

    (B) increase from B to C.

    (C) decrease from B to A.

    (D) decrease from C to A.

    (E) decrease from C to B.

25. The monopsonistic labor market shown above is initially in equilibrium. If a minimum wage is set at W, the level of employment will

    (A) decrease.

    (B) increase.

    (C) stay the same.

    (D) increase or decrease depending on how the supply curve shifts as a result of the change in the wage rate.

    (E) be indeterminant under monopsonistic labor markets.

Sample Short Free-Response Questions

1. What determines the demand for a resource (factor of production)? Why is the demand for a resource downward sloping? What determines the elasticity of demand for a resource (factor of production)?

2. List three factors that would increase the demand for a resource, and explain why the factors would increase demand.

3. Assume a monopsonistic labor market is in equilibrium. What are the effects on wages and employment if workers organize themselves into a labor union and demand an increase in wages?

4. Compare the wage level and employment level of a firm in a perfectly competitive labor market with the wage level and employment level of a firm in a monopsonistic labor market. Both firms have similar costs and sell their goods in a perfectly competitive product market.

5. What is economic rent? Draw a supply curve and a demand curve for land. Now show the effects of an increase in the demand for land. What happens to the amount of economic rent if the demand for land increases?

*6. Use the table below to answer this question.

Production Table for Company X

Number of Workers	Total Product
0	0
1	20
2	50
3	70
4	80
5	86
6	88
7	87

(A) Given this information, what is the marginal product of the second worker?

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*Actual free-response question from a past AP test. Reprinted by permission of the College Entrance Examination Board, the copyright owner. For limited use by NCEE.

(B) Define the law of diminishing returns, and explain fully why diminishing returns occurs.

(C) In the table above, diminishing returns sets in with the addition of which worker?

(D) Why does the addition of the seventh worker result in a decline of total product? Explain fully why this decline occurs.

Sample Long Free-Response Questions

*1. Initially a country's labor market is competitive and in long-run equilibrium. Now assume that new workers enter the labor market.

    (A) Assuming no other changes, explain how the increase in the number of workers will affect each of the following in the short run:
        (i)   The wage rate of workers
        (ii)   The costs of production for a typical firm
        (iii) The price of goods produced by the workers

    (B) Assume that the demand for the goods produced by the workers in Part A decreases. Explain the effect of this decrease on each of the following:
        (i)   The price of goods produced by the workers
        (ii)   The demand for labor
        (iii) The wage rate of workers

    (C) Now assume that legislation requiring the establishment of a national minimum wage is proposed. Explain at what level this minimum wage would need to be set to be effective.

    (D) Explain how the imposition of the minimum wage in Part C would affect each of the following:
        (i)   The number of workers employed in the labor market
        (ii)   The costs of production for a typical firm

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Stone Mills
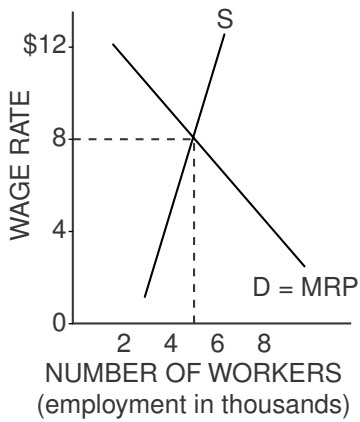
University
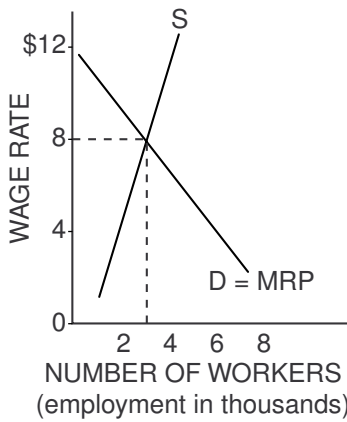
Electronics
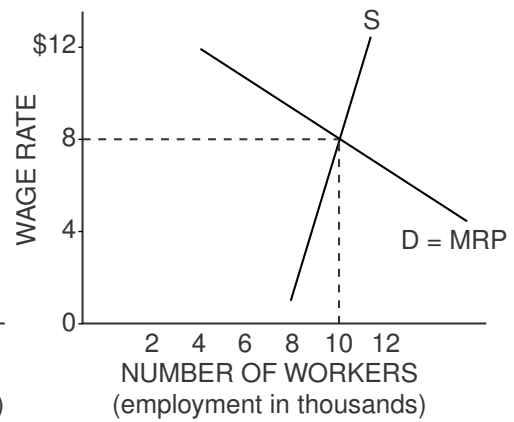
*2. Suppose that University City has a perfectly competitive labor market in which there are only three kinds of employment for a certain type of labor. Also suppose that the demand for and supply of this type of labor in each market are as shown above. Total employment is 18,000 persons, as shown, and the average wage rate in each kind of employment is the same: $8 per hour. Now imagine that there is a strong union covering workers in the electronics industry and that it succeeds in negotiating with the employers in this industry an average wage of $10. Show on the graphs the effect this will have on the whole University City labor market, and discuss your analysis by indicating who gains and who loses from the increase in the wages of electronics workers.

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*Adapted from Phillip Saunders, *Introduction to Microeconomics: Student Workbook*, 18th ed. (Bloomington, Ind., 1998). Copyright © 1998 Phillip Saunders. All rights reserved.

*3. In the United States, textiles are sold in two separate and perfectly competitive markets. The textiles produced in the United States are sold in Market A, and imported textiles are sold in Market B.

(A) Explain how the supply curve for textiles produced in the United States will be affected by each of the following:

  (i) A decrease in the number of firms in the United States producing textiles
  (ii) An increase in the price of textiles

Assume that the textiles produced in Market A and Market B are close substitutes.

(B) Using one graph for Market A and another for Market B, show and explain how a substantial increase in the tariff on textiles imported into the United States will affect each of the following:

  (i) Equilibrium price and quantity of textiles sold in Market B (imported textiles)
  (ii) Equilibrium price and quantity of textiles sold in Market A (textiles produced in the United States)

4. Use the table below to answer this question.

Production Table for Company X

Number of Workers	Total Product	Marginal Product
0	0	
1	10	
2	25	
3	45	
4	60	
5	70	
6	75	
7	77	

(A) Calculate the marginal product of each worker.

(B) Draw a graph plotting marginal product.

(C) On the marginal product graph you drew in Part (B), indicate the range of the following:
   (i)   Increasing marginal returns
   (ii)   Decreasing marginal returns
   (iii) Negative marginal returns

(D) State the law of diminishing marginal returns, and explain fully why diminishing marginal returns occurs.

(E) Explain what happens to total product where each of the following occurs:
   (i)   Marginal product is rising.

   (ii)   Marginal product is falling but positive.

   (iii) Marginal product is negative.

(F) Should Company X hire the fourth worker? Explain fully why or why not.

■ The economic functions of government include enforcing laws and contracts, maintaining competition, redistributing income, providing public goods, correcting allocations for externalities and stabilizing the economy.

■ Government must provide public goods because a private market will not provide them. Pure public goods must meet the criteria of shared consumption and nonexclusion.

■ Even a perfectly competitive market sometimes produces too little of some goods and too much of others; economists call this situation a market failure.

■ The market overproduces goods that create negative externalities. A negative externality is created when part of the cost of a transaction is borne by third parties who are not directly involved in the transaction. Negative externalities include pollution and harmful effects of pesticides and smoking. Negative externalities are sometimes called spillover costs.

■ The market underproduces goods that create positive externalities. A positive externality is created when benefits of a transaction or activity are received by third parties who are not directly involved in the transaction. Positive externalities include education, vaccinations against diseases and flood control. Positive externalities are sometimes called spillover benefits.

■ Government tries to discourage the production of goods that involve negative externalities and encourage the production of goods that involve positive externalities.

■ Cleaning up the environment would be efficient if it were cleaned up to the point where the marginal social benefits of the cleanup were equal to the marginal social costs, and the cleanup were done at the least possible cost.

■ Most economists believe the environment can be cleaned up at a lower cost by substituting market incentives for command and control policies.

■ Sometimes buyers and sellers do not have perfect information, so the market outcome is not efficient. In these cases, it may be necessary for government to intervene in the market.

■ The theory of public choice uses economic analysis to evaluate government operation and policies.

■ Public-choice theorists believe politicians and government officials are as self-interested as business people. However, instead of trying to maximize profits, "political entrepreneurs" seek to maximize power, salaries, prestige and votes. This behavior results in government waste and inefficiency.

■ Governments tax to raise revenue. Some taxes are based on the ability-to-pay theory, while others are based on the benefits-received theory.

■ Tax rates can be progressive, proportional or regressive.

■ Government taxing and spending policies can change a society's distribution of income.

■ The incidence of a tax can be shifted from the person paying the government to someone else. This is accomplished through changes in prices, income and outputs.

Private or Public? Public Goods and Services

Our Economic System

An economic system is the way in which people and societies organize economic life to answer three basic questions: *What* goods and services will be produced? *How* will they be produced? *For whom* will they be produced?

In the United States and Canada, most production decisions — what, how and for whom to produce — are made in the marketplace through interactions of buyers and sellers. This is called the *private sector* of our economy. Other decisions are made by different levels of government. This is called the *public sector* of our economy. Our economic system is often called a *mixed* system since we produce a combination of private and public goods and services.

What Goods and Services Should Governments Provide?

While many goods and services can be provided by the private or the public sector, a few can be provided effectively only by governments. Generally, governments try to provide the goods and services that are necessary but that individual consumers might not purchase directly on their own. There are two criteria that can be used in judging whether something should be provided by governments: *nonexclusion* and *shared consumption.*

Nonexclusion

In some situations people cannot be excluded from the benefits of a good or service even if they do not pay for it. If only some of the people bought national defense, for example, the others could not be excluded from the benefits. The nonpurchasers would be protected just as much as the purchasers. People who receive the benefit of a good but don't pay for it are called *free riders.*

Shared consumption (or joint use)

In some situations one person's use or consumption of a good or service does not reduce its usefulness to others. The security one person receives from a street light is not diminished by a neighbor receiving the same security. The protection the street light provides is not reduced by additional people using it.

Private businesses will not produce things that people are not willing to buy, and individual consumers are very reluctant to pay directly for goods and services from which others who do not pay will reap the benefits: "Why should I be the one to buy the street light if everyone else is getting the benefits?" Governments therefore must provide some goods and services such as national defense, flood control, and judicial and legal systems that are characterized by shared consumption and are necessarily or should be nonexclusive. Public goods are goods that are provided by government and will not be provided by the private sector.

Private and Public Goods

Pure private goods are subject to exclusion and not subject to shared consumption. They are purchased directly in the marketplace. *Pure public goods* are subject to nonexclusion and shared consumption. They are purchased indirectly through tax dollars.

Some goods have elements of both private goods and public goods. Fishing in the ocean, for example, is generally not subject to exclusion; but once one person catches a fish, it is not available to others. Likewise, it is sometimes possible to exclude people from theaters, national parks or even roads by charging admission fees or tolls. But one person camping in a park or driving on a highway usually does not reduce the usefulness of these places to others. Controversy often arises over how these *mixed goods* — sometimes called *common-pool resources* and *toll goods* — should be provided and who should pay for them. Some goods do not fall into neat boxes, but show degrees of nonexclusion and shared consumption.

✳ Figure 52.1
Combinations of Exclusion and Shared Consumption

		Shared Consumption	
		No	Yes
Exclusion	Yes	Pure private goods: haircuts, bread, ice cream	Toll goods: theaters, cable TV, parks, toll roads
	No	Common-pool resources: fish taken from the ocean, irrigation water taken from a river, congested roads	Pure public goods: national defense, flood control, street lights, mosquito abatement, judicial and legal system

1. What is the difference between the private and public sectors of our economy?

2. What are the characteristics of a pure private good?

3. What are the characteristics of a pure public good?

4. Place each of the goods and services in the list below into one of the four boxes in Figure 52.2. Circle the box that contains pure private goods. Then draw two circles around the box that contains pure public goods.

(A) A college education

(B) Electric power

(C) A haircut

(D) National defense

(E) A private amusement park

(F) Spraying for mosquitoes

(G) Cable television

(H) Canine rabies shots

(I) Street lights

(J) The St. Lawrence Seaway

(K) Public toll roads and bridges

(L) Police and fire protection

(M) Health care

(N) National forest campgrounds

(O) Potato chips

(P) Auto airbags

✳ Figure 52.2

Determining Combinations of Exclusion and Shared Consumption

		Shared Consumption	
		No	Yes
Exclusion	Yes		
	No		

5. What is a free rider? Select three goods from the list in Question 4 that could have free riders.

Private versus Public

Most people can agree about which goods and services are purely private and which are purely public. The goods and services that do not nicely fall into these two categories often lead to debate — sometimes heated debate — in our society.

Indicate your judgments concerning the degree to which you believe the goods and services listed below can best be provided by the government or by private business. Do so by placing the capital letter that precedes each good or service on the continuum at the bottom of the page. If you believe private business should provide a particular good or service, place its capital letter at or near the left end of the line, where the words "Purely Private" appear. Place toward the right end of the line letters for the goods or services you think are better provided by government. If you regard the answer as debatable, place the letter in or near the middle.

When you have placed all the letters on the continuum, draw two vertical lines. One line separates the purely private goods from the goods and services that may provoke an argument; the other line separates the purely public goods and services from the goods and services that may provoke an argument.

Now propose a set of criteria or process to divide the continuum of goods and services between purely private and purely public goods. Then divide the continuum based on the criteria you have established.

(A) College education

(B) Electric power

(C) National defense

(D) Groceries

(E) Water

(F) Professional sports events

(G) Postal Service

(H) Interstate highway facilities

(I) Elementary schooling

(J) Police protection

(K) Garbage collection

(L) Recreational facilities

Who Should Provide the Product?

Rival / Exclusive　　　　　　　　　Either　　　　　　　　　Shared / Nonexclusive

Purely Private　　　　　　　　　　　　　　　　　　　　　　　　Purely Public

Externalities

A *market externality* refers to a situation where some of the costs or benefits from an activity fall on someone other than the one pursuing the activity. Externalities may be either positive (the activity provides a benefit to someone else) or negative (the activity places a cost on someone else). Costs that fall on someone else are called *external* or *social costs*, and benefits that fall on someone else are called *external* or *social benefits*.

$$\text{Total cost} = \text{Private cost} + \text{Social cost}$$
$$\text{Total benefit} = \text{Private benefit} + \text{Social benefit}$$

Externalities are sometimes referred to as *third-party costs* or *third-party benefits*, when they fall on a third party: someone outside the transaction, not one of the buyers or sellers in a market.

In the presence of externalities, the demand curve still represents the private marginal benefit of a given unit, and the supply curve represents the private marginal cost. Now, however, we need to differentiate among the total, private and social components of costs and benefits.

For decision making on the margin, we can rewrite the above equations as

$$MC_T = MC_P + MC_S$$
$$MB_T = MB_P + MB_S$$

(Careful here, the terminology may be different in your book. For example, in many textbooks, the *marginal social cost* encompasses the private and nonprivate components.)

Activity written by Margaret Ray, Mary Washington College, Fredericksburg, Va.

✳ Figure 54.1
External Benefits
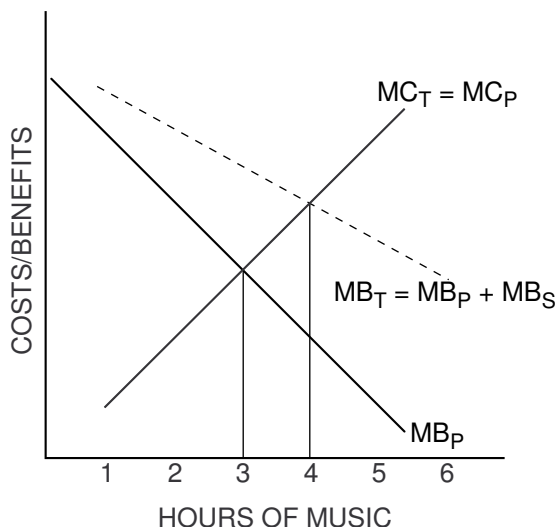
✳ Figure 54.2
External Costs
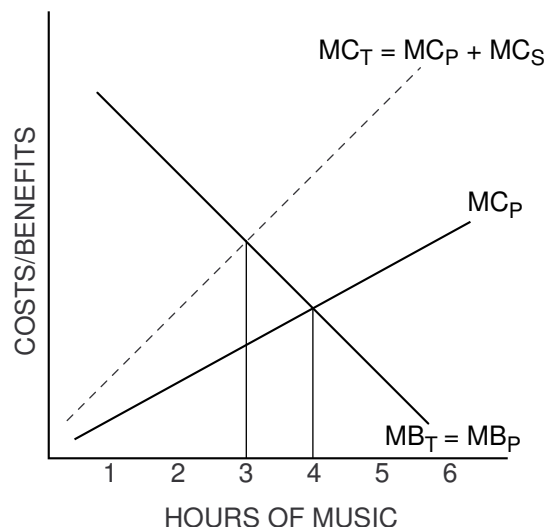
1. Imagine you live with a roommate in a college residence hall. Your roommate has brought an expensive stereo system to play in your room. Figure 54.1 shows your roommate's private marginal cost (MC_P) and marginal benefit (MB_P) curves for music played on the stereo system. Based on your roommate's private costs and benefits from playing music, answer the following questions.

(A) If your roommate considers only the private costs and benefits from playing music, how many hours of music are played? _____ Label the number of hours $Q_{PRIVATE}$ on the graph.

(B) Assume that your roommate plays music only at times that do not disturb you and plays only music that you also enjoy. The dashed line shows that MB_T exceeds MB_P. Therefore, how do total benefits (social benefits plus private benefits) differ from private benefits? _____ If your roommate considers the social benefits from playing music as well as the private benefits, what happens to the quantity of music played? _____. Label the number of hours Q_{SOCIAL} on the graph.

(C) Now assume that your roommate plays music only at times that you are trying to study and plays only music that you hate. The dashed line on Figure 54.2 shows that MC_T exceeds MC_P. If your roommate considers the social costs from playing music as well as the private costs, what happens to the quantity of music played? _____ Label the number of hours Q_{SOCIAL} on the graph.

(D) When your roommate does not consider your external benefits in the absence of external costs from playing music, the number of hours played is *(efficient / too high / too low)*. When your roommate does not consider your external costs in the absence of external benefits, the number of hours played is *(efficient / too high / too low)*.

(E) How can government regulation (in this case, residence-hall rules) assure the efficient quantity of music? Consider the circumstances under which prohibiting stereos or imposing daily "quiet hours" are efficient ways to regulate stereo use in the hall. Does economics suggest a more-efficient approach to stereo regulation?

2. For each of these activities, explain whether there is a positive or negative externality:

Private high school education

Smog from an electric power plant

Your neighbor's yappy dog

Prekindergarten measles vaccinations

3. The Women's National Basketball Association (WNBA) has awarded a new franchise for a basketball team to be established in Metropolis, but only if the new team has a new arena in which to play. Proponents of the franchise argue that the team will generate new business, provide jobs, increase tax revenue and promote tourism in Metropolis. Opponents argue that most of the money spent on basketball games will come from Metropolis-area residents who will simply reduce their spending on other activities. Thus there will be few new jobs, little increase in tax revenue and few new tourists coming to Metropolis. Others say the new stadium will cause property values to fall and create traffic, parking and noise problems.

Voters have the following three proposals before them:

Proposal 1: No city money should be used in the construction of the arena.

Proposal 2: The city should place a tax on each ticket sold to pay for the arena.

Proposal 3: The city should build the arena and lease the right to play there to the basketball team at a subsidized rate.

Using your knowledge of externalities, answer the following questions.

(A) What assumption does Proposal 1 make about the size of external costs compared with external benefits? Explain.

(B) How does Proposal 2 change the composition of total costs and benefits to adjust for externalities (both positive and negative)?

(C) What assumptions does Proposal 3 make about external costs and benefits to reach an efficient solution?

Summary

4. When positive externalities are involved, private markets (*underproduce / overproduce*).

5. When negative externalities are involved, private markets (*underproduce / overproduce*).

6. Why do economists refer to the presence of an externality as a *market failure*?

7. How would a tax remedy a negative externality?

8. How would a subsidy mitigate underproduction in the presence of a positive externality?

Private or Public? The Coase Theorem

When an activity results in a negative externality (external cost), the market outcome will not be efficient. In these cases, the government may choose to intervene in the market and impose some form of regulation, for example, a legal restriction or a tax. If the external cost the activity creates is borne by those who conduct the activity, the market outcome will be efficient.

For example, if a firm dumps its waste into a river, it pollutes the river and creates a negative externality (external cost) for those downstream. The government may intervene to restrict dumping in the river, or it may impose an effluent tax (a tax on each unit of pollution released into the river). If the firm is forced to pay for the pollution it releases into the river, it will dump less. A sufficiently high tax will lead to the optimal reduction in river pollution from the firm. Thus, the firm has internalized the externality.

However, in some situations it may not be necessary to regulate a market to achieve an efficient outcome. It may be possible for the parties affected by an externality to negotiate an efficient outcome on their own. For example, if people who use the river downstream can negotiate with the polluting firm, they may be willing to pay the firm to stop polluting. This idea is embodied in the *Coase Theorem*, which states that if those who are affected by an externality can negotiate, they may arrive at an efficient solution to the externality problem.

Two firms are involved in a dispute: Grunge Inc., a manufacturing firm, pollutes a nearby river. The pollution travels downstream past White Water Expeditions, a company that provides river rafting trips. Dumping its waste into the river cuts Grunge's waste-disposal costs, while decreasing the number of people who want to raft on the river. The profits of the two firms (both with and without waste dumping) are shown in Figure 55.1.

✳ Figure 55.1
Profits per Month

	With Dumping	Without Dumping
Grunge Inc.	$2,300	$2,000
White Water Expeditions	$1,500	$2,000

1. What are the total returns to both companies with and without dumping? Which situation (dumping or no dumping) is socially optimal — in other words, provides the highest combined returns?

Activity written by Margaret Ray, Mary Washington College, Fredericksburg, Va.

2. If there is no government intervention in the market, and the two companies do not communicate, will Grunge dump waste into the river? Why or why not?

3. What is the cost to Grunge not to dump waste into the river? How much would White Water have to pay to clean up the waste? _____

4. What is the cost of the pollution to White Water each month? How much would White Water be willing to pay Grunge to stop dumping waste into the river? _____

5. If Grunge and White Water could negotiate, at no cost, could they come to an agreement that would eliminate the externality problem and result in the efficient outcome? If not, why not? If so, what would the payment be?

6. Does it matter who has the property right: Grunge to dump or White Water to have clean water? Explain.

Economic Efficiency and the Optimum Amount of Pollution Cleanup

The human and environmental damage caused by industrial pollution often arouses public attention. While it might be nice to restore our environment to its pristine state, pollution cleanup is costly and dollars used for cleanup might be spent elsewhere. It seems, then, that some sort of balance must be struck between undesirable pollution and costly cleanup. Let's apply marginal analysis to determine an optimal amount of pollution and environmental cleanup.

The marginal social benefit of cleaning up pollution tends to decline as additional units of pollution are cleaned up. The marginal social cost of cleaning up pollution tends to increase as additional units of pollution are cleaned up. If society has accurate information about the total social (public and private) benefits and costs of various amounts of cleanup, society should be able to get as close as possible to the most efficient, or optimum, level of cleanup (and/or pollution) where the marginal social benefits equal the marginal social costs.

Imagine a community in which two firms emit foul sludge into two local lakes (one for each firm). Natural processes gradually break down the sludge, rendering it harmless. But as long as emissions continue, a certain equilibrium level of harmful sludge remains in the lake. If emissions are lowered, this equilibrium level will be reduced. The opposite occurs if emissions are increased. Currently each firm emits five units of sludge each week.

Given the information in Figures 56.1 and 56.2, you should be able to determine the optimal level of emissions for this community. Fill in the blanks in the tables, and use this information to answer Questions 1 through 4. Assume that benefits obtained and costs incurred for cleanup at one lake have no impact on costs and benefits at the other lake.

✳ Figure 56.1

Firm 1

Reduction of Foul Sludge Emissions	Total Social Benefit of Cleanup	Marginal Social Benefit of Cleanup	Total Social Cost of Cleanup	Marginal Social Cost of Cleanup
0	0	—	0	—
1	350	350	160	160
2	650		370	
3	900		630	
4	1,100		940	
5	1,250		1,300	

1. Using the data from Figure 56.1, fill in the blanks or underline the correct words in parentheses.

   (A) The marginal social benefit (MSB) of reducing emissions by the first unit of foul sludge is _____, and the marginal social cost (MSC) of reducing pollution emissions by the first unit is _____. The marginal social benefit (MSB) is *(greater than / equal to / less than)* the marginal social cost (MSC), so it *(would / would not)* be economically efficient from society's perspective to require Firm 1 to reduce pollution emission by the first unit.

   (B) The MSB of eliminating the last (fifth) unit of foul sludge is _____, and the MSC of reducing pollution emissions by the last (fifth) unit is _____. The MSB is *(greater than / equal to / less than)* the MSC, so it *(would / would not)* be economically efficient from society's perspective to require Firm 1 to reduce pollution emission by the fifth unit.

✳ Figure 56.2

Firm 2

Reduction of Foul Sludge Emissions	Total Social Benefit of Cleanup	Marginal Social Benefit of Cleanup	Total Social Cost of Cleanup	Marginal Social Cost of Cleanup
0	0	—	0	—
1	350	350	160	160
2	650		320	
3	900		480	
4	1,100		640	
5	1,250		800	

2. Using the data from Figure 56.2, fill in the blanks or underline the correct words in parentheses.

(A) The marginal social benefit (MSB) of eliminating the fourth unit of foul sludge is _____, and the marginal social cost (MSC) of reducing pollution emissions by this fourth unit is _____. The MSB is *(greater than / equal to / less than)* the MSC, so it *(would / would not)* be economically efficient from society's perspective to require Firm 2 to reduce pollution emissions by four units.

(B) The MSB of eliminating the fifth (last) unit of foul sludge is _____, and the MSC of reducing pollution emissions by this fifth (last) unit is _____. The MSB is *(greater than / equal to / less than)* the MSC, so it *(would / would not)* be economically efficient from society's perspective to require Firm 2 to reduce pollution emissions by five units.

3. If this community decides to adopt a pollution-control ordinance aimed at maximizing economic efficiency, how should it evaluate each of the following three proposals, all of which are based on the data presented above? Write a brief economic evaluation in the space provided after each of the proposals. Be sure to use the concepts of marginal social benefit and marginal social cost in your analysis.

Proposal A. "Foul sludge emissions should be reduced (by five units) to zero for each firm because we should eliminate all pollution from our lakes regardless of the cost." This proposal *(would / would not)* maximize economic efficiency, because

Proposal B. "Firm 2 should be forced to reduce emissions (by five units) to zero because the total social benefit of cleanup ($1,250) exceeds the total social cost of cleaning up ($800). But Firm 1 should not be forced to clean up at all, because the total social benefit of cleanup ($1,250) is less than the total social cost of reducing emissions to zero ($1,300)." This proposal *(would / would not)* maximize economic efficiency, because

Proposal C. "In the interest of equal treatment for all, each firm should be forced to clean up (reduce emissions) by three units." This proposal *(would / would not)* maximize economic efficiency because

4. Using the data presented above, what do you think is the optimum level of emissions reduction for each firm? Explain briefly why you chose these numbers.

Firm 1: _____ units

Firm 2: _____ units

The Economics of Information

One of the assumptions made about competitive markets is that all participants in the market have *perfect information* (i.e., make informed decisions). For example, consumers know the prices of the goods they purchase and all available substitutes. Producers know the costs of production. With this information, each can make an informed decision about how much to consume or produce. This assumption is necessary for the competitive market outcome to be efficient.

But in many instances, both sides of the market do not have perfect information, and the market outcome is not efficient. Because consumers do not have perfect knowledge about the quality of the product, the price of the product compared with alternative products or negative side effects of the product, they may make incorrect decisions. There are costs to acquiring information, and the market may result in too little information for one side to make an informed and efficient decision. In these cases, it may be necessary for the government to intervene in the market.

The analysis below concerns government intervention when there is imperfect knowledge. Of course, markets do provide strong incentives for consumers to acquire information and for producers to provide it. These are two particular information problems that government might resolve.

Asymmetric Information: Either buyers or sellers have better information about the good or service sold in the market.

Adverse Selection Problem: The uninformed side of the market must choose from an undesirable (or adverse) selection of goods. The problem occurs when one party knows information and the other doesn't, causing the less-informed party to incur major costs.

For example, insurance buyers know more about their probability of filing a claim than insurance companies. The person buying car insurance knows all about his or her own driving habits, while the insurance company has to estimate the likelihood that this person will engage in driving behaviors — for example, driving recklessly — that will lead to insurance claims. Adverse selection in the case of insurance means insurance will be purchased disproportionately by those who are more costly to insure: the high-risk individuals.

Moral Hazard Problem: Protection against risk encourages people to take more risks. Moral hazard occurs when an individual takes an action (unknown to the insurer) that increases the probability an insurer will have to pay a claim. When individuals become willing to take an action they otherwise would not because they know they are covered by insurance, it leads to moral hazard. For example, car insurance encourages reckless driving because some drivers are willing to drive recklessly when they know they are insured. The protection provided by insurance leads to more decisions to drive recklessly: moral hazard!

For an efficient outcome in the market, consumers need to have information about the prices of products and their substitutes. In addition, efficiency requires that consumers be able to get the required information at the least cost possible. Product labeling can often determine whether a consumer will obtain the required information at a low cost.

Activity written by Margaret Ray, Mary Washington College, Fredericksburg, Va.

1. Determine which of the following packages of identical laundry detergent is the best buy.

Size	Weight	Price
Jumbo	25.0 oz.	94 cents
Large	1.4 lbs.	85 cents
Grande	25.5 oz.	97 cents

(A) Were you able to determine the best buy?

(B) Are you likely to take the time needed to determine the best buy for each product you purchase?

(C) If you don't determine the best buy for each product, what happens to market efficiency?

2. The government has established regulations for product labels to help provide consumers with the information necessary to make efficient decisions in the market. Give an example of information that could be put on a product label to address each of the information asymmetries below.

(A) You want to purchase the best buy in the laundry-detergent example above.

(B) You want to buy a candy bar, and you are allergic to peanuts.

(C) You are on a special diet that requires you to eat 24 grams of fiber each day.

(D) You want to buy fresh cottage cheese.

(E) You want to purchase a car that keeps your gas costs low.

3. Assume you are in the market for a new car.

(A) Do you have perfect information about the performance and safety of the car? Why or why not?

(B) How does a competitive market help provide this information?

(C) How can government help provide this information?

Public-Choice Economics

Government has important economic functions, but local, state and federal governments often perform these functions poorly. Even though political leaders are elected by the people, they often ignore the wishes of the people and promote the agendas of special-interest groups. Economists from the *public-choice school of economics* believe that the politicians are following their own self-interest and that governmental decisions make sense when viewed through the public-choice theory lens. Government critics are amazed at the seemingly irrational actions governments take that seem to go against the "public interest." Public-choice theorists reason that when viewed in the context of economic theory, these governmental actions make perfect sense.

Nobel Prize-Winning Theory

In 1986, James Buchanan, a professor at George Mason University, received the Nobel Prize in economics for his theory of governmental decision making. Mr. Buchanan's theory was summarized in a *Wall Street Journal* article published on Oct. 17, 1986:

> "He started a whole new field of political economy," Alan Meltzer, an economist at Carnegie-Mellon University, said. "Economic theory was concerned with governments' choices of policy. It didn't think about the mechanism that would cause a policy to be adopted. What Mr. Buchanan did was to put the best parts of political science and economics together."

> "Economists generally had adopted a good-will theory of government," Mr. Meltzer said. "Jim Buchanan believes that politicians make decisions the same way other people do — by first thinking of their own interests — which may not be the same as the public's interest."

Thus, politicians, voters and government officials are as self-interested as businesspeople. But instead of trying to maximize profits, "political entrepreneurs" seek to maximize power, salaries, prestige and votes. In the private market, competition channels self-interested behavior into the public good. Adam Smith (1723-1790) said that an individual's self-interested behavior was "led by an invisible hand to promote an end which was no part of his intention. Nor is [this] always the worse for society. . . . By pursuing his own interest he frequently promotes [the interest] of the society more effectively than when he really intends to promote it."

Mr. Buchanan maintains that the political "invisible hand" has different effects from those of the invisible hand of the marketplace. According to public-choice economics, concentrated special interests usually prevail over the public good in any given issue because special interests get a big benefit while each citizen has a small loss. This is true even though the total public loss is greater than the benefits to special interests. The only exception is when the public has a strong opinion on the issue and follows the way legislators vote on it. The political invisible hand thus explains why governments have huge budget deficits, why special-interest groups prevail over majority opinion, why bureaucracies expand and why governments often protect the interests of businesses over consumers.

Activity written by John Morton, National Council on Economic Education, New York, N.Y. Several of the mysteries were adapted from Mark C. Schug, *The Great Economic Mysteries Book* (New York: National Council on Economic Education, 2000).

Basic Tenets of Public-Choice Theory

1. Median-Voter Model

The *median-voter model* predicts that the preferences of the median or middle voter will prevail over other choices. Therefore, successful candidates for office appeal to the median voter with middle-of-the-road policies.

A simple model illustrates this idea: Three college students share an apartment. They are considering buying electronic equipment. One roommate loves movies and feels only an expensive DVD player does justice to films. The second roommate thinks movies are a waste of time. The third roommate likes movies but thinks a less expensive VCR is adequate. They agree to vote on what to buy.

The median-voter model predicts that they will choose the VCR. The movie buff prefers a VCR to nothing. The roommate who thinks movies are a waste of time and doesn't want to buy anything prefers a cheaper VCR to the more expensive DVD. Both extremes lose, and the middle choice wins.

2. Rational Ignorance

Voting is essential to a democracy, but fewer than 50 percent of eligible voters vote. Economists look to cost-benefit analysis to explain this phenomenon. In the public sector, one vote is a small portion of the total votes cast, while the opportunity cost of researching public-policy choices is high in terms of time and effort. In the private sector, a person makes choices and bears the costs and benefits of these choices. Buying a car is costly. Researching the choices can result in a better performing car at a lower price. Therefore, it might be rational to seek information on auto choices and equally rational to remain ignorant about public-policy choices.

3. Rent Seeking

In any democracy, special-interest groups seek favorable treatment from government. Government policies can provide benefits that market forces would eliminate. In a perfectly competitive market, a resource will be obtained at a price where the marginal benefit or marginal revenue is equal to the marginal cost. This brings about an efficient allocation of resources. Government decisions often bring about an *inefficient allocation* of resources. Special interests spend millions of dollars on lobbying efforts and campaign contributions. The purpose is to seek benefits in excess of what they could obtain in the market. The process of special-interest groups seeking subsidies of market advantages is called *rent seeking* because these excess benefits are called *rents.* A rent is a payment to a resource owner in excess of what is necessary to obtain the resource. The payment exceeds the opportunity cost. Rent seeking is particularly successful when the benefits are concentrated while the costs are spread out among large numbers of people. In this situation, many pay a small cost even though the total cost of the policy exceeds the benefits. The cost to each person is so small that most people ignore the policy.

Solving the Mysteries of Government Policy

A mystery is a situation or event in which something seems to be at odds with our sense of what ordinary experience and good judgment would suggest under the circumstances. Public-choice theory applies this to government actions. Your job is to solve the following mysteries. Provide a full explanation of each mystery. Your explanation might include the following:

- What are the costs and benefits involved in the choice? Does cost/benefit analysis explain the mystery?

- How do incentives affect the choice? Which incentives are most important?

- Does the median-voter, rational-ignorance or rent-seeking model help explain and solve the mystery?

1. The Electoral College Mystery

In the American system of government, majority rule is a fundamental principle of democracy. Yet in presidential elections, we continue to use the Electoral College — an undemocratic institution. For example, in 2000, George W. Bush won the electoral vote while Al Gore won the popular vote.

Why does a democratic country tolerate an undemocratic institution?

2. The Mystery of the Voter Who Doesn't Vote

Americans are known around the world for their love of liberty and democracy. Many Americans have fought and died to protect their system of government and way of life. Free elections are central to this system of government. Together with safeguards for protecting individual rights, free elections are the heart of American democracy. Yet many Americans do not vote. Only about half of all eligible voters vote in presidential elections even though the 2000 presidential election was decided by a few votes in Florida.

Why don't more Americans vote?

3. The Mystery of Too Much Milk

Farm-price supports cost taxpayers billions of dollars each year. The purpose of farm-price supports is to raise the price of agricultural products, which costs consumers more money. Direct payments to dairy farmers alone cost taxpayers a lot of money. In Florida in a recent year, dairy farmers received $40.3 million in price-support payments. Most of this money went to 177 farmers. Each of these farmers received an average payment of $226,000. In a recent year, a bill was introduced in Congress to lower price supports for dairy farmers. Even though 55 percent of milk production takes place in five states and even though a majority of Congressional districts have no dairy farmers, the bill was soundly defeated.

Why would members of Congress fail to pass a law that saves their taxpayer and consumer constituents money?

4. The Urban Housing Mystery

While most American cities provide an adequate range of housing possibilities for their citizens, some do not. In New York City, people looking for a place to live typically have a hard time finding apartments. Some of the apartments they find are ones you wouldn't want: units without sinks or hot water, for example. The problem is not a lack of space. New York City has many abandoned apartment buildings. At the same time, some New Yorkers live in luxury apartments and pay low rents. For example, a 1993 news report stated that former New York City Mayor Ed Koch paid $441 per month for an apartment worth about $1,200 per month at market rental rates.

Why do some New Yorkers face a housing crisis while others are secure in choice apartments, paying low monthly rent?

5. The Trade Barrier Mystery

Since David Ricardo's time, almost all economists have believed voluntary trade improves a nation's standard of living. Yet almost every nation in the world passes laws that reduce trade. These laws involve tariffs, quotas and regulatory restrictions.

Why would nations pass laws that lower their standards of living?

What Is a Fair Tax?

Almost everyone is concerned about how much we pay in taxes. The best way to determine how much tax you pay is to state your tax as an *effective tax rate.* An effective tax rate is the percentage of your income you pay in taxes. This differs from a *nominal tax rate* or *legal tax rate.* For example, a sales tax rate may be 5 percent (the nominal rate), but this does not mean that all people pay 5 percent of their income in sales taxes. Outlays for rent, insurance and medical bills, among other things, may not be subject to sales taxes. Neither, of course, are savings.

Let's look at the effective tax rate of Joanne Walters. If she made $30,000 a year and paid $6,000 in taxes, her effective tax rate would be 20 percent. You can figure this by dividing $6,000 by $30,000:

$$\frac{\$\ 6,000}{\$30,000} = 20\%$$

There are three kinds of effective tax rates. If a tax is *progressive,* the effective tax rate increases as a person's income goes up. For example, a person who makes $30,000 a year may have an effective tax rate of 10 percent, while a person who makes $45,000 a year may have an effective rate of 18 percent.

If a tax is *proportional,* the effective tax rate stays the same regardless of income. In this case, a person making $30,000 a year and a person making $45,000 a year would both be taxed at an effective rate of 10 percent. Of course, the person making $45,000 a year would pay more total dollars in taxes. A proportional tax is sometimes called a *flat tax.*

If a tax is *regressive,* the effective tax rate decreases as income goes up. For example, a person making $30,000 a year might pay an effective tax rate of 10 percent, while a person who makes $45,000 a year might pay an effective tax rate of 8 percent.

Now answer these questions to see if you understand progressive, proportional and regressive tax rates. Fill in the answer blanks or underline the correct words in parentheses. Provide longer answers when required.

1. A tax that requires each person to pay 3 percent regardless of income is a _____ tax.

2. A tax levied at 1 percent on the first $1,000 of income, 2 percent on the next $1,000 and so on is a _____ tax.

3. A tax levied at 15 percent on the first $1,000 of income, 12 percent on the next $1,000 and so on is a _____ tax.

4. If it is true that a person with an income of $20,000 a year typically buys 10 gallons of gasoline per week and a person with an income of $40,000 typically buys 15 gallons of gasoline per week, this suggests that an excise tax of 40 cents per gallon would be a _____ tax. Explain.

5. Rick Morales has an income of $50,000 but spends only $40,000 on taxable goods. Chet Burton has an income of $25,000 and spends it all on taxable goods. Assuming an 8 percent sales tax, Mr. Morales will pay _____ in sales taxes, which is _____ percent of his total income. On the other hand, Mr. Burton will pay _____ in sales taxes, which is _____ percent of his total income. Therefore, we can conclude that the sales tax is _____.

6. Since the sales tax has the same nominal or legal rate based on sales, why is it regressive? What steps could be taken to make it less regressive?

7. Suppose that the government runs a pension fund to which all workers must contribute. The employee contribution rate is 6.2 percent on the first $84,900 of income. All income in excess of $84,900 is not taxed for pension purposes.

   (A) What was the effective pension tax rate for a person earning $20,000 a year? _____

   (B) What was the effective pension tax rate for a person earning $84,900? _____

   (C) What was the effective pension tax rate for a person earning $169,800? _____

   (D) Therefore, the pension tax is a *(progressive / proportional / regressive)* tax up to $84,900 of income. For incomes above _____, the tax is *(progressive / proportional / regressive)*.

   (E) In addition to the pension tax, people must pay 1.45 percent of their income for medical benefits. There is no income limit on the medical-care tax. Does this make the total tax for pension and medical care more or less regressive? Why?

Who Pays the Income Tax?

Who actually pays income taxes? Do "the rich" escape paying their "fair" share of taxes? Is most of the income tax paid by middle-income people? Who are the rich? These questions are important for several reasons:

- Taxes can redistribute income. Like Robin Hood, government can tax the rich and redistribute this money to the poor. Instead of money, most tax revenue is redistributed in the form of college scholarships, food stamps, medical care, housing assistance and other services for lower-income families. While the merits of these programs are debatable, almost no one would agree that a "Robin Hood in reverse" policy is beneficial: taxing the poor and redistributing it to the rich.

- Some people think taxes should have *vertical equity*, that is, distribute the tax burden fairly across people with different abilities to pay. This argument for progressive taxation maintains that the rich have more ability to pay taxes, and therefore should bear a larger burden than low-income families.

- Some people think that income should be distributed more equally than it is today.

Activity written by Joe Baker, Center for Economic Education, Southern Utah University, Cedar City, Utah.

Part A

Figures 60.1 and 60.2 contain information from the Tax Foundation regarding shares of income, taxes and tax rates for federal income-tax returns in 1987 and 1997. Use the tables to answer the questions.

✳ Figure 60.1
Table of Federal Individual Income-Tax Return Data 1987

Percent of All Taxpayers	Income Range	Group's Share of Total Income (AGI)	Group's Share of Total Taxes	Group's Average Tax Rate
Top 1%	Above $139,289	12.3%	24.8%	26.4%
Top 5%	Above $68,414	25.7%	43.3%	22.1%
Top 10%	Above $52,921	36.9%	55.6%	19.8%
Top 25%	Above $33,983	60.8%	76.9%	16.6%
Top 50%	Above $17,768	84.4%	93.9%	14.6%
Bottom 50%	Below $17,768	15.6%	6.1%	5.1%
All Taxpayers		100.0%	100.0%	13.1%

✳ Figure 60.2
Table of Federal Individual Income-Tax Return Data 1997

Percent of All Taxpayers	Income Range	Group's Share of Total Income (AGI)	Group's Share of Total Taxes	Group's Average Tax Rate
Top 1%	Above $250,736	17.4%	33.2%	27.6%
Top 5%	Above $108,048	31.8%	51.9%	23.6%
Top 10%	Above $79,212	42.8%	63.2%	21.4%
Top 25%	Above $48,173	65.0%	81.7%	18.2%
Top 50%	Above $24,393	86.2%	95.7%	16.1%
Bottom 50%	Below $24,393	13.8%	4.3%	4.5%
All Taxpayers		100.0%	100.0%	14.5%

1. Suppose you defined "the rich" as the top 10 percent of all income earners. In 1997, what was the minimum income that you had to earn to be "rich"?

   (A) $33,983   (B) $52,921   (C) $79,212   (D) $250,736

2. What percentage of total income taxes did the top 1 percent of income earners pay in 1997?

   (A) none   (B) 1 percent   (C) 27.6 percent   (D) 33.2 percent

3. In 1997, the bottom half of all income earners paid what percentage of total income taxes?

   (A) 4.3 percent   (B) 6.1 percent   (C) 16.1 percent   (D) 50 percent

4. In 1997, the average U.S. taxpayer paid 14.5 percent of his or her income in taxes. Based on the information in the table, how would you classify U.S. income taxes (as discussed in Activity 59)?

   (A) Regressive   (B) Proportional   (C) Progressive

5. Compare 1987 with 1997. What is the best description of what happened to income tax burdens over this 10-year period?

   (A) The rich paid a smaller share, and more taxes fell on lower-income earners.
   (B) The income tax became more progressive, and the rich paid a larger share.
   (C) There was little change in the relative tax burdens of the rich and lower-income earners between 1987 and 1997.

Part B

Many people are concerned that "the rich are getting richer and the poor are getting poorer." Using the data in Figures 60.1 and 60.2, answer the following questions:

6. Is there evidence that the rich got richer and the poor got poorer between 1987 and 1997? Defend your answer.

7. Many politicians argue that the wealthy are not paying their "fair share" of taxes. Based on the data, do you agree or disagree? Why? Be sure to specify the criterion you are using.

8. Would you argue that the U.S. progressive income tax hinders or promotes income equality? Why?

Sample Multiple-Choice Questions

Circle the letter of each correct answer.

1. Which of the following characterizes a public good?
   (A) People who do not pay for the good can be excluded from using it.
   (B) If one person uses the good, it does not prevent others from using it.
   (C) It is easy to determine who must pay for the good.
   (D) The good is produced by the public sector.
   (E) The good exhibits positive externalities.

2. The free rider problem is associated with
   (A) all market goods.
   (B) goods that are exclusionary.
   (C) bus transportation.
   (D) the production of public goods.
   (E) the production of public transportation.

3. Which of the following best meets the criteria of a public good?
   (A) A phone card
   (B) An airline ticket
   (C) National defense
   (D) A college education
   (E) A restaurant

4. The market system fails to produce public goods because
   (A) there is no need or demand for such goods.
   (B) private firms cannot restrict the benefits of such goods to consumers who are willing to pay for them.
   (C) public enterprises can produce such goods at lower cost than can private enterprises.
   (D) their production seriously distorts the distribution of income.
   (E) a person unwilling to pay can be excluded from the benefits that the product provides.

5. Which of the following are economic functions of government?
   I. Enforcing laws and contracts
   II. Providing public goods
   III. Correcting market failures
   (A) I only
   (B) II only
   (C) III only
   (D) II and III only
   (E) I, II, and III

6. In a market economy, the distribution of income is
   (A) equitable because people who are willing to work earn income.
   (B) primarily determined by the prices of scarce resources people own.
   (C) primarily determined by the government through its power to tax.
   (D) distributed on the basis of need.
   (E) always more equal than in a command economy.

7. If the production of a good creates negative externalities, the private market will produce

   (A) too much of the good at too low a price.

   (B) too much of the good at too high a price.

   (C) too little of the good at too high a price.

   (D) too little of the good at too low a price.

   (E) the right amount of the good at the correct price.

8. If the production of a good creates positive externalities, the private market will produce

   (A) too much of the good at too high a price.

   (B) too much of the good at too low a price.

   (C) too little of the good at too low a price.

   (D) too little of the good at too high a price.

   (E) the right amount of the good at the correct price.

Use the supply and demand graph below to answer questions 9, 10 and 11. In the graph, B is the current equilibrium level of output of this product, and A is the optimal level of output from society's perspective. S is the original supply curve without a tax, and S₁ is the new supply curve.
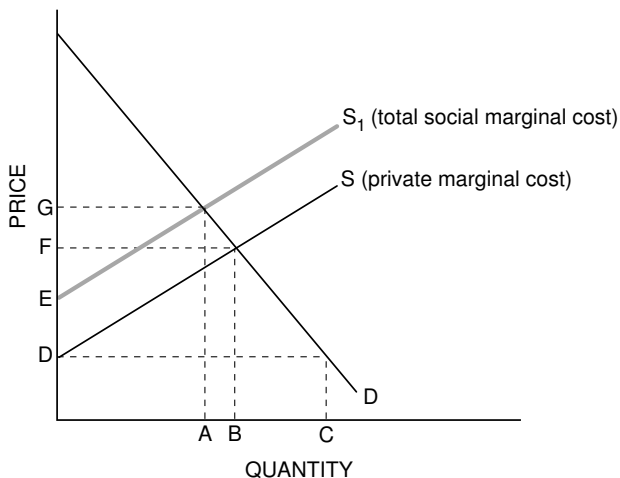
9. This graph indicates that there are

   (A) spillover benefits from the production of this product.

   (B) spillover costs from the production of this product.

   (C) too few resources devoted to the production of the product.

   (D) positive externalities from the production of the product.

   (E) no spillover costs or benefits associated with the production of the good.

10. One solution to this externality problem is to

   (A) give consumers a subsidy of the amount FG.

   (B) give producers a subsidy of the amount AB.

   (C) tax producers by the amount DE.

   (D) tax consumers by the amount EF.

   (E) tax consumers by the amount DG.

11. If the government corrects this externality problem with a tax so that all the costs are included in the cost of production, then the product price will be

   (A) A.

   (B) D.

   (C) E.

   (D) F.

   (E) G.

Use the supply and demand graph below to answer questions 12, 13 and 14. In the graph, A represents the current equilibrium level of output of this product, and B represents the optimal level of output from society's perspective.
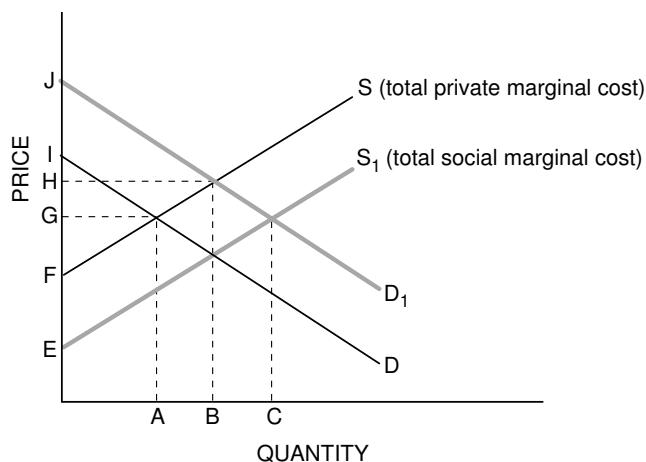
12. This supply and demand graph indicates that there are

    (A) spillover benefits from the production of this product.

    (B) spillover costs from the production of this product.

    (C) too many resources devoted to the production of this product.

    (D) negative externalities from the production of this product.

    (E) no spillover costs or benefits to society.

13. Assume the government decides to correct this externality by providing a subsidy to producers. This can be demonstrated as a

    (A) shift in the demand curve from D_1 to D.

    (B) shift in the supply curve from S to S_1.

    (C) shift in the supply curve from S_1 to S.

    (D) shift in both the demand curve from D to D_1 and the supply curve from S_1 to S.

    (E) shift in both the demand curve from D_1 to D and the supply curve from S to S_1.

14. The amount of the subsidy to be given to correct this externality problem is

    (A) AB.   (B) BC.   (C) EF.

    (D) GH.   (E) AC.

15. Which of the following best summarizes most economists' position on allocating resources to control pollution?

    (A) All forms of air and water pollution should be eliminated.

    (B) Government policies to reduce pollution have zero opportunity costs.

    (C) Pollution should be reduced to the point where the marginal social cost of pollution control equals the marginal social benefit of pollution control.

    (D) Pollution should be reduced to the point where the total social cost of pollution control equals the total social benefit of pollution control.

    (E) Pollution should be reduced to the point where the average social cost of pollution control equals the average social benefit of pollution control.

16. Public-choice theory is based on the idea that

    (A) self-interest motivates participants only in the private sector of the economy.

    (B) self-interest motivates participants only in the public sector of the economy.

    (C) self-interest motivates participants in both the public and private sectors of the economy.

    (D) the interests of society are the main interest of participants in the public sector of the economy.

    (E) the interests of society are the main interest of participants in the private sector of the economy.

17. With which of the following statements would advocates of public-choice theory agree?
    I. Government leaders usually consider the public interest over special interests.
    II. Because of the median-voter hypothesis, there is not much difference in the views of candidates running for office.
    III. Most voters are well informed about candidates for office.

    (A) I only
    (B) II only
    (C) III only
    (D) II and III only
    (E) I, II, and III

18. Government may attempt to reduce income inequality by doing which of the following?
    I. Provide transfer payments to the poor
    II. Directly influence market prices, such as establishing a minimum wage
    III. Tax high-income earners at a higher rate than low-income earners

    (A) I only
    (B) II only
    (C) III only
    (D) I and II only
    (E) I, II, and III

19. Which of the following is the best example of a tax based on the ability-to-pay theory of taxation?
    (A) Sales tax
    (B) Property tax
    (C) Excise tax on gasoline
    (D) Federal income tax
    (E) Highway tolls

20. In which of the following taxes is the benefits-received principle of taxation most evident?
    (A) Corporation income tax
    (B) Personal income tax
    (C) Excise tax on gasoline
    (D) Inheritance taxes
    (E) Progressive tax rates

21. Which of the following taxes is considered regressive?
    (A) Sales tax
    (B) Personal income tax
    (C) Corporation income tax
    (D) Federal estate tax
    (E) Inheritance taxes

22. An excise tax will generate the most revenue for government if
    (A) demand is unit elastic.
    (B) demand is elastic.
    (C) demand is inelastic.
    (D) supply is inelastic.
    (E) supply is perfectly elastic.

23. "The President's proposal to increase the federal tax on gasoline is intended to reduce the amount of gasoline purchased and raise more revenue." The second goal would be best served (and the first goal least served) if the demand for gasoline were which of the following?
    (A) Unit elastic
    (B) Relatively elastic
    (C) Relatively inelastic
    (D) Perfectly inelastic
    (E) Decreased by the tax

24. A motel owner is upset that the scenic view provided by the neighboring wooded property will be destroyed because the property's owner plans to cut and sell the trees to a commercial lumber company. The Coase Theorem suggests that this dispute could be resolved by

(A) a law passed by the government.

(B) a zoning ordinance against commercial lumbering.

(C) the owners themselves.

(D) a government fine for cutting trees.

(E) an environmental campaign against altering wildlife habitat.

25. If the government increases the amount of government insurance on bank deposits, this action would

(A) increase the probability of adverse selection.

(B) lessen the probability of adverse selection.

(C) increase the probability of a moral-hazard problem.

(D) lessen the probability of a moral hazard problem.

(E) eliminate the probability of adverse selection or moral hazard.

Sample Short Free-Response Questions

1. Is elementary and secondary education a public good? Evaluate education by the criteria of a public good.

2. Use a supply and demand graph to illustrate a negative externality. Explain your graph.

3. Use a supply and demand graph to illustrate a positive externality. Explain your graph.

4. The city council in Portland, Ore., must decide on a tax increase to finance a new airport. What advice would you give if you believed in the benefits-received theory of taxation? What advice would you give if you believed in the ability-to-pay theory?

*5. How could you change a 6 percent sales tax on all purchases to make it less regressive?

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*Question 5 written by Gregory Breuner, Lakeridge High School, Lake Oswego, Ore., and Mary Jo Thomas, South Eugene High School, Eugene, Ore.

Sample Long Free-Response Questions

*1. One approach to the problem of pollution control in a market economy is the selling of pollution "credits" known also as *externality rights.* The pollution-control agency of Big Falls has determined that 500 tons of pollutants may be discharged into the Fox River each year because this is the determined recycling capacity of the river. Accordingly, 500 pollution credits entitling the owners to dump one ton of pollutants into the river in a year are available. The city intends to make 500 pollution credits available each year.

(A) What would be the shape of the supply curve for pollution credits in 2004? Why?

(B) What would be the shape of the supply curve for pollution credits in 2009? Why?

(C) Draw and label the demand curve for pollution credits in 2004. Why would it assume this shape?

(D) On the same graph, draw and label the demand curve for pollution credits in 2009. Explain what would happen to the demand over time.

(E) What would happen to the equilibrium price for pollution credits over time? Why?

(F) What are the costs and benefits of this approach to pollution control for producers, consumers and the public?

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*Written by Gregory Breuner, Lakeridge High School, Lake Oswego, Ore., and Mary Jo Thomas, South Eugene High School, Eugene, Ore.

2. Assume that the government places a 50 percent tax on Greebes. Neither the demand for Greebes nor the supply of Greebes is perfectly inelastic or perfectly elastic. With the use of graphs, explain what will determine the incidence of this tax on Greebes.

3. What is the difference between the ability-to-pay theory of taxation and the benefits-received theory? Give an example of a tax that meets the criteria of the ability-to-pay theory and a tax that meets the criteria of the benefits-received theory.