

# SOLUTIONS MANUAL



PARKIN  
MACROECONOMICS

NINTH EDITION





## Answers to the Review Quizzes

### Page 34

- 1. How does the production possibilities frontier illustrate scarcity?**

The unattainable combinations of production that lie *beyond* the *PPF* curve illustrate the concept of *scarcity*. There simply are not enough resources to produce any of these combinations of outputs. Additionally, while moving along the *PPF* to increase the production of one good requires that the production of another good be reduced, which also illustrates scarcity.
- 2. How does the production possibilities frontier illustrate production efficiency?**

The combinations of outputs that lie on the *PPF* curve illustrate the concept of production efficiency. These points are the maximum production points possible and are attained only by producing the goods and services at the lowest possible cost. Any point inside the frontier reflects production where one or both outputs may be increased without decreasing the other output level. Clearly, such points cannot be production efficient.
- 3. How does the production possibilities frontier show that every choice involves a tradeoff?**

Movements along the *PPF* frontier illustrates that producing more of one good requires producing less of other good. This observation is the *tradeoff* that must be made when producing output efficiently.
- 4. How does the production possibilities frontier illustrate opportunity cost?**

The negative slope of the production possibility curve illustrates the concept of *opportunity cost*. Moving along the production possibility frontier, producing additional units of a good requires that the output of another good must fall. This sacrifice is the opportunity cost of producing more of the first good.
- 5. Why is opportunity cost a ratio?**

The slope of the *PPF* is a *ratio* that expresses the quantity of lost production of the good on the *y*-axis when increasing the production of the good on the *x*-axis. The steeper the slope, the greater ratio, and the greater is the opportunity cost of increasing the output of the good measured along the horizontal axis.
- 6. Why does the *PPF* for most goods bow outward so that opportunity cost increases as the quantity produced of a good increases?**

Some resources are better suited to produce one type of good or service, like pizza. Other resources are better suited to produce other goods or services, like DVDs. If society allocates resources wisely, it will use each resource to produce the kind of output for which it is best suited. For the *PPF*, measure pizza production on the *x*-axis and DVD production on the *y*-axis. A small increase in pizza output when pizza production is relatively *low* requires only small increases in the use of those resources still good at making pizza and not good at making DVDs. This yields a small decrease in DVD production for a large increase in pizza production, creating a relatively *low opportunity cost* reflected in the gentle slope of the *PPF* curve over this range of output. However, the same small increases in pizza output when pizza production is relatively *large* will require society to devote to pizza production those resources that are less suited to making pizza and more suited at making DVDs. This reallocation of resources yields a relatively small increase in pizza output for a large decrease in DVD output, creating a relatively *high opportunity cost*

reflected in the steep slope of the *PPF* curve over this range of output. The opportunity cost of pizza production increases with the quantity of pizza produced as the slope of the *PPF* curve becomes ever steeper, creating the *bowed out* effect (the concavity of the *PPF* function).

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**1. What is marginal cost? How is it measured?**

*Marginal cost* is the opportunity cost of producing *one more unit* of a good or service. Along a *PPF* marginal cost is reflected in the absolute value of the slope of the *PPF* curve. In particular, the magnitude of the slope of the *PPF* is the marginal cost of a unit of the good measured along the *x*-axis.

**2. What is marginal benefit? How is it measured?**

The *marginal benefit* of a good or service is the benefit received from the last unit consumed. It is measured by what an individual is willing to give up (or pay) for that last unit.

**3. How does the marginal benefit from a good change as the quantity produced of that good increases?**

As the more of a good is consumed, the marginal benefit received from each unit is smaller than the marginal benefit received from the unit consumed immediately before it, and is larger than the marginal benefit from the unit consumed immediately after it. This set of results is known as the principle of *decreasing marginal benefit* and is often assumed by economists to be a common characteristic of an individual's preferences over most goods and services in the economy.

**4. What is allocative efficiency and how does it relate to the production possibilities frontier?**

*Production efficiency* occurs when production takes place at a point on the *PPF* curve. This indicates that all available resources are being used for production and society cannot produce additional units of one good or service without reducing the output of another good or service. *Allocative efficiency*, however, requires that the goods and services produced are those that provide the greatest possible benefit. This definition means that the allocative efficient level of output is the point on the *PPF* (and hence is a production efficient point) for which the marginal benefit equals the marginal cost.

**5. What conditions must be satisfied if resources are used efficiently?**

Resources are used efficiently when more of one good or service cannot be produced without producing less of some of another good or service that is *valued more highly*. This is known as *allocative efficiency* and it occurs when: 1) production efficiency is achieved, and 2) the marginal benefit received from the last unit produced is equal to the marginal cost of producing the last unit.

### Page 39

**1. What generates economic growth?**

The two key factors that generate economic growth are *technological change* and *capital accumulation*. Technological change allows an economy to produce more with the same amount of limited resources, but in a new way that increases output. Capital accumulation, including human capital, means that an economy actually has increased its available resources for production.

**2. How does economic growth influence the production possibilities frontier?**

Economic growth shifts the *PPF* outward. Persistent outward shifts in the production possibility frontier—economic growth—are caused by the accumulation of resources, such as more capital equipment, and/or by the development of new technology.

**3. What is the opportunity cost of economic growth?**

When a society devotes more of its scarce resources to research and development of new technologies, or devotes additional resources to produce more capital equipment, both decisions lead to increased consumption opportunities in future periods at the cost of less consumption today. The loss of consumption today is the opportunity cost borne by society for creating economic growth.

4. **Why has Hong Kong experienced faster economic growth than the United States?**  
Hong Kong chose to devote a greater proportion of its available resources to the production of capital than the United States. This allowed Hong Kong to grow at a faster rate (at least until recently). By foregoing consumption and producing a greater proportion of capital goods over the last few decades, Hong Kong was able to achieve output per person equal to about 88 percent of that in the United States.
5. **Does economic growth overcome scarcity?**  
Scarcity reflects the inability to satisfy all our wants. Regardless of the amount of economic growth, scarcity will remain present because it will never be possible to satisfy all our wants. For instance it will never be possible to satisfy all the wants of the several thousand people who all would like to ski the best slopes on Vail with only their family and a few best friends present. So economic growth allows more wants to be satisfied but it does not eliminate scarcity.

### Page 43

1. **What gives a person a comparative advantage?**  
A person has a comparative advantage in production when he or she gives up the *least amount* of production of another good or service than anyone else when producing one unit of another good or service. If the person gives up the least amount of other goods and services to produce a particular product, the person has the lowest opportunity cost of producing that product.
2. **Distinguish between comparative advantage and absolute advantage.**  
A person has a *comparative advantage* in producing a good when he or she has the lowest opportunity cost of producing it. *Comparative advantage is based on the output forgone.* A person has an *absolute advantage* in production when he or she uses the least amount of *time or resources* to produce one unit of that particular good or service. *Absolute advantage is a measure of productivity in using inputs.*
3. **Why do people specialize and trade?**  
People can compare consumption possibilities from producing all goods and services through *self-sufficiency* against specializing in producing only those goods and services that reflect their comparative advantage and trading their output with others who do the same. People can then see that the consumption possibilities from specialization and trade are greater and more complex than under self-sufficiency. Therefore it is in people's own *self-interest* to specialize. It was Adam Smith who first pointed out in the *Wealth of Nations* how individuals *voluntarily* engage in this socially beneficial and cooperative activity through the pursuit of their own self-interest, rather than for society's best interests.
4. **What are the gains from specialization and trade?**  
From society's standpoint, the total output of goods and services available for consumption is greater with specialization and trade. From an individual's perspective, each person who specializes enjoys being able to consume a more complex and larger bundle of goods and services after trading with others who have also specialized, than would otherwise be possible under self-sufficiency. These increases are the gains from specialization and trade for society and for individuals.
5. **What is the source of the gains from trade?**  
As long as people have different opportunity costs of producing goods or services, total output is higher with specialization had trade than if each individual produced goods and services under self-sufficiency. This increase in output is the gains from trade.
6. **How does dynamic comparative advantage arise?**  
A person or country achieves a *dynamic comparative advantage* when that person or country gains a comparative advantage from *learning-by-doing*. Learning-by-doing occurs when a person or country pursues specialization vigorously, resulting in a declining opportunity cost (and therefore a rising comparative advantage) over time for producing a particular good or service.

**Page 45****1. Why are social institutions such as firms, markets, property rights, and money necessary?**

*Firms* are necessary to allow people to specialize. Without firms, specialization would be limited because a person would need to specialize in the *entire* production of a product. With firms people are able to specialize in producing particular bits of a product. In order for a society to enjoy the fruits of specialization and trade, the individuals who comprise that society must voluntarily desire to specialize in the first place. Discovering trade opportunities after a person has specialized in his or her comparative advantage in production is what allows that person to gain from his or her own specialization efforts. Trading opportunities can only take place if a *market* exists where people observe prices to discover available trade opportunities. *Money* is necessary to allow low-cost trading in markets. Without money, goods would need to be directly exchanged for other goods, a difficult and unwieldy situation. Finally people must enjoy social recognition of and government protection of *property rights* to have confidence that their commitments to trade arrangements will be respected by everyone in the market.

**2. What are the main functions of markets?**

The main function of a market is to enable buyers and sellers to get information and to do business with each other. Markets have evolved because they facilitate trade, that is, they facilitate the ability of buyers and sellers to trade with each other.

**3. What are the flows in the market economy that go from firms to households and the flows from households to firms?**

On the real side of the economy, goods and services flow from firms to households. On the monetary side of the economy, payments for factors of production, wages, rent, interest, and profits, flow from firms to households. Flowing from households to firms on the monetary side of the economy are the expenditures on goods and services and on the real side are the factors of production, labor, land, capital, and entrepreneurship.

## Answers to the Problems and Applications

1. **Brazil produces ethanol from sugar, and the land used to grow sugar can be used to grow food crops. Suppose that Brazil's production possibilities for ethanol and food crops are given in the table.**

Ethanol (barrels per day)	and	Food crops (tons per day)
70	and	0
64	and	1
54	and	2
40	and	3
22	and	4
0	and	5

- a. **Draw a graph of Brazil's PPF and explain how your graph illustrates scarcity.**

Figure 2.1 shows Brazil's PPF. The production possibilities frontier itself indicates scarcity because it shows the limits to what can be produced. In particular, production combinations of ethanol and food crops that lie beyond the production possibilities frontier are not attainable.

- b. **If Brazil produces 40 barrels of ethanol a day, how much food must it produce if it achieves production efficiency?**

If Brazil produces 40 barrels of ethanol per day, it achieves production efficiency if it also produces 3 tons of food per day.

- c. **Why does Brazil face a tradeoff on its PPF?**

Brazil faces a tradeoff on its PPF because Brazil's resources and technology are limited. For Brazil to produce more of one good, it must shift factors of production away from the other good. Therefore to increase production of one good requires decreasing production of the other good, which reflects a tradeoff.

- d. **If Brazil increases its production of ethanol from 40 barrels per day to 54 barrels per day, what is the opportunity cost of the additional ethanol?**

When Brazil is production efficient and increases its production of ethanol from 40 barrels per day to 54 barrels per day, it must decrease its production of food crops from 3 tons per day to 2 tons per day. Hence the opportunity cost of the additional ethanol is 1 ton of food per day for the entire 14 barrels of ethanol or 1/14 of a ton of food per barrel of ethanol.

- e. **If Brazil increases its production of food crops from 2 tons per day to 3 tons per day, what is the opportunity cost of the additional food?**

When Brazil is production efficient and increases its production of food crops from 2 tons per day to 3 tons per day, it must decrease its production of ethanol from 54 barrels per day to 40 barrels per day. Hence the opportunity cost of the additional 1 ton of food crops is 14 barrels of ethanol.

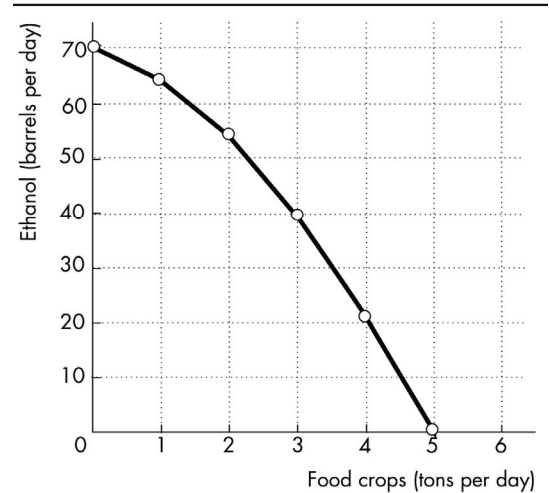
- f. **What is the relationship between your answers to d and e?**

The opportunity costs are reciprocals of each other. That is, the opportunity cost of 1 ton of food crops is 14 barrels of ethanol and the opportunity cost of 1 barrel of ethanol is 1/14 of a ton of food crops.

- g. **Does Brazil face an increasing opportunity cost of ethanol? What feature of the PPF that you've drawn illustrates increasing opportunity cost?**

Brazil faces an increasing opportunity cost of ethanol production. For instance, when increasing ethanol production from 0 barrels per day to 22 barrels the opportunity cost of a barrel of ethanol is 1/22 of a ton

FIGURE 2.1  
Problem 1



of food while increasing ethanol production another 18 barrels per day (to a total of 40 barrels per day) has an opportunity cost of 1/18 of a ton of food per barrel of ethanol. The *PPF*'s bowed outward shape reflects the increasing opportunity cost.

**2. Define marginal cost and use the information provided in the table in problem 1 to calculate the marginal cost of producing a ton of food when the quantity produced is 2.5 tons per day.**

The marginal cost of a good is the opportunity cost of producing one more unit of the good. When the quantity of food produced is 2.5 tons, the marginal cost of a ton of food is the opportunity cost of increasing the production of food from 2 tons per day to 3 tons per day. If this increase is carried out, the production of ethanol falls 54 barrels per day to 40 barrels per day, a decrease of 14 barrels per day. The opportunity cost of increasing food production is the decrease in ethanol product, so the opportunity cost of producing a ton of food when 2.5 tons of food per day are produced is 14 barrels of ethanol per day.

**3. Define marginal benefit, explain how it is measured, and explain why the information provided in the table in problem 1 does not enable you to calculate the marginal benefit of food.**

The marginal benefit of a good is the benefit received from consuming one more unit of the product. The marginal benefit of a good or service is measured by the most people are willing to pay for one more unit of it. The data in the table do not provide information on how much people are willing to pay for an additional unit of food. Hence the table has no information on the marginal benefit of food.

**4. Distinguish between *production efficiency* and *allocative efficiency*. Explain why many production possibilities achieve production efficiency but only one achieves allocative efficiency.**

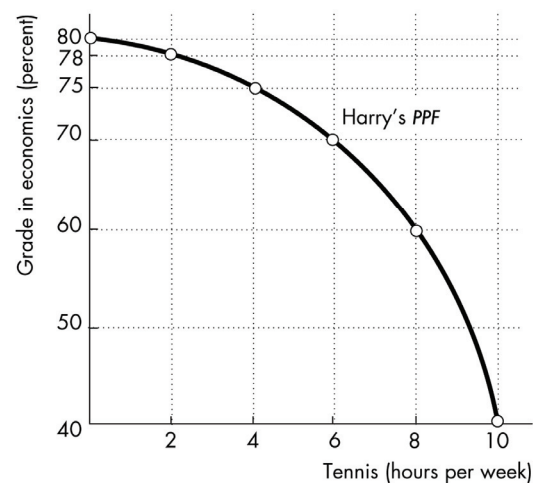
Production efficiency occurs when goods and services are produced at the lowest cost. This definition means that production efficiency occurs at any point *on* the *PPF*. Therefore *all* of the production points on the *PPF* are production efficient. Allocative efficiency occurs when goods and services are produced at the lowest cost *and* in the quantities that provide the greatest possible benefit. The allocatively efficient production point is the *single* point on the *PPF* that has the greatest possible benefit.

**5. Harry enjoys tennis but wants a high grade in his economics course. Figure 2.2 shows the limits to what he can achieve: It is Harry's *PPF* for these two "goods." Figure 2.3 (on the next page) shows Harry's *MB* curve for tennis.**

**a. What is Harry's marginal cost of tennis if he plays for (i) 3 hours a week; (ii) 5 hours a week; and (iii) 7 hours a week.**

(i) Harry's marginal cost of an hour of tennis is 1.5 percentage points. When Harry increases the time he plays tennis from 2 hours to 4 hours, his grade in economics falls from 78 percent to 75 percent. His opportunity cost of these 2 additional hours of tennis is 3 percentage points, so his marginal cost of playing tennis for the third hour per week is 1.5 percentage points. (ii) Harry's marginal cost of an hour of tennis is 2.5 percentage points. When Harry increases the time he plays tennis from 4 hours to 6 hours, his grade in economics falls from 75 percent to 70 percent. His opportunity cost of these 2 additional hours of tennis

**FIGURE 2.2**  
**Problem 5**



is 5 percentage points. So his marginal cost of playing tennis for the fifth hour per week is 2.5 percentage points. (iii) Harry's marginal cost of an hour of tennis is 5 percentage points. When Harry increases the time he plays tennis from 6 hours to 8 hours, his grade in economics falls from 70 percent to 60 percent. His opportunity cost of these 2 additional hours of tennis is 10 percentage points. So his marginal cost of playing tennis for the seventh hour per week is 5 percentage points.

- b. If Harry uses his time to achieve allocative efficiency, what is his economics grade and how many hours of tennis does he play?**

Harry's grade in economics is 66 percent and he plays tennis for 7 hours per week. From the answer to part (a), Harry's marginal cost of playing the third hour a week of tennis is 1.5 percentage points, his marginal cost of playing tennis the fifth hour a week is 2.5 percentage points and his marginal cost

of playing tennis the seventh hour a week is 5 percentage points. Plot these three opportunity costs in Figure 2.3 to create Harry's marginal cost curve. Harry's opportunity cost of playing tennis increases as he spends more time on tennis. Harry uses his time efficiently if he plays tennis for 7 hours a week because when he plays 7 hours a week his marginal benefit from the seventh hour of tennis, 5 percentage points, equals its marginal cost, also 5 percentage points. When Harry plays 7 hours of tennis, the *PPF* in Figure 2.2 shows that his grade in economics is 66 percent.

- c. Explain why Harry would be worse off getting a grade higher than your answer to b.**

If Harry studied for enough hours to get a higher grade, he would have fewer hours to play tennis. Harry's marginal benefit from tennis would be greater than his marginal cost, so he would be more efficient (better off) if he played more hours of tennis and took a lower grade.

- d. If Harry becomes a tennis superstar with big earnings from tennis, what happens to his *PPF*, *MB* curve, and efficient time allocation?**

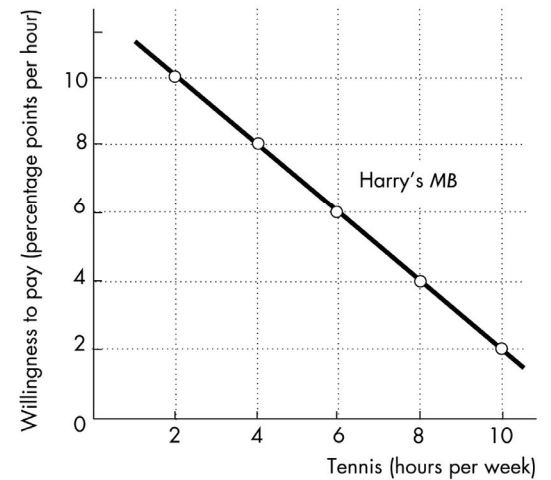
If Harry becomes a tennis superstar, his *PPF* does not change. Harry's *PPF* shows the grade he can produce for different hours of playing tennis and these production possibilities are unaffected by Harry's superstar status. As a result Harry's *MC* curve does not change. However Harry's *MB* from playing tennis increases because of his big paydays so his *MB* curve shifts rightward. As a result, Harry's efficient allocation of time now allocates more time to tennis (and results in a lower grade).

- e. If Harry suddenly finds high grades in economics easier to attain, what happens to his *PPF*, *MB* curve, and efficient time allocation?**

If Harry finds high grades easier to attain his *PPF* shifts outward. In particular for every level of tennis playing his grade in economics is higher. As a result Harry's marginal cost of earning a high grade in economics is reduced so that Harry's *MC* curve shifts downward. Harry's *MB* curve does not change because Harry's marginal benefit from a high grade has not changed. Harry's efficient time allocation results in Harry increasing the number of hours of tennis he plays.

FIGURE 2.3

## Problem 5





6. A farm grows wheat and produces pork. The marginal cost of producing each of these products increases as more of it is produced.

- a. Make a graph that illustrates the farm's *PPF*.

The *PPF* is illustrated in Figure 2.4 as  $PPF_0$ .

Because the marginal cost of both wheat and pork increase as more of the product is produced, the *PPF* displays increasing opportunity cost so it has the "conventional" bowed outward shape.

- b. The farm adopts a new technology that allows it to use fewer resources to fatten pigs. Use your graph to illustrate the impact of the new technology on the farm's *PPF*.

The new technology rotates the *PPF* outward from  $PPF_0$  to  $PPF_1$ .

- c. With the farm using the new technology described in b, has the opportunity cost of producing a ton of wheat increased, decreased, or remained the same? Explain and illustrate your answer.

The opportunity cost of producing wheat has increased. The opportunity cost of a bushel of wheat is equal to the magnitude of the slopes of the *PPFs* illustrated in Figure 2.4. The slope of  $PPF_1$  has a larger magnitude than the slope of  $PPF_0$  so the opportunity cost of a bushel of wheat is higher along  $PPF_1$ . Alternatively, the opportunity cost of increasing wheat product from 600 bushels per week to 800 bushels per week along  $PPF_1$  is 35 hundred pounds of pork but is only 20 hundred pounds of pork along  $PPF_0$ .

- d. Is the farm more efficient with the new technology than it was with the old one? Why?

The farm is able to produce more with the new technology than with the old, but it is not necessarily more efficient. If the farm was producing on its *PPF* before the new technology and after, the farm was production efficient both before the new technology and after.

7. In one hour, Sue can produce 40 caps or 4 jackets and Tessa can produce 80 caps or 4 jackets.

- a. Calculate Sue's opportunity cost of producing a cap.

Sue forgoes 4 jackets to produce 40 caps, so Sue's opportunity cost of producing one cap is  $(4 \text{ jackets}) / (40 \text{ caps})$  or 0.1 jacket per cap.

- b. Calculate Tessa's opportunity cost of producing a cap.

Tessa forgoes 4 jackets to produce 80 caps, so Tessa's opportunity cost of producing one cap is  $(4 \text{ jackets}) / (80 \text{ caps})$  or 0.05 jacket per cap.

- c. Who has a comparative advantage in producing caps?

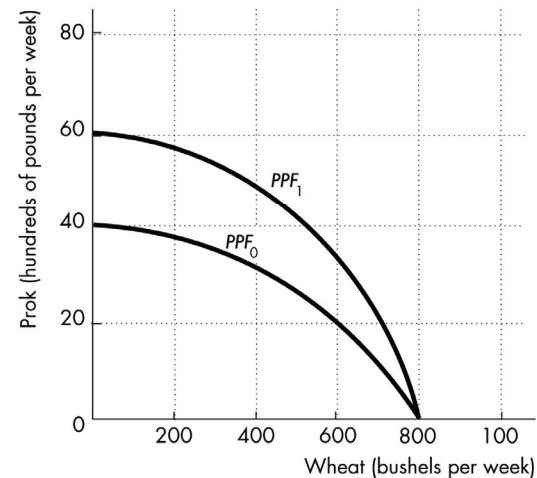
Tessa's opportunity cost of a cap is lower than Sue's opportunity cost, so Tessa has a comparative advantage in producing caps.

- d. If Sue and Tessa specialize in producing the good in which each of them has a comparative advantage, and they trade 1 jacket for 15 caps, who gains from the specialization and trade?

Tessa specializes in caps and Sue specializes in jackets. Both Sue and Tessa gain from trade. Sue gains because she can obtain caps from Tessa at a cost of  $(1 \text{ jacket}) / (15 \text{ caps})$ , which is 0.067 jacket per cap, a cost that is lower than what it would cost her to produce caps herself. Tessa also gains from trade because she trades caps for jackets for 0.067 jacket per cap, which is higher than her cost of producing a cap.

FIGURE 2.4

Problem 6



- 8 Suppose that Tessa buys a new machine for making jackets that enables her to make 20 jackets an hour. (She can still make only 80 caps per hour.)
- Who now has a comparative advantage in producing jackets?**  
Sue forgoes 40 caps to produce 4 jackets, so Sue's opportunity cost of producing one jacket is  $(40 \text{ caps}) / (4 \text{ jackets})$  or 10 caps per jacket. Tessa forgoes 80 caps to produce 20 jackets, so Tessa's opportunity cost of producing one jacket is  $(80 \text{ caps}) / (20 \text{ jackets})$  or 4 caps per jacket. Tessa has the comparative advantage in producing jackets because her opportunity cost of a jacket is lower than Sue's opportunity cost.
  - Can Sue and Tessa still gain from trade?**  
Tessa and Sue can still gain from trade because Tessa (now) has a comparative advantage in producing jackets and Sue (now) has a comparative advantage in producing caps. Tessa will produce jackets and Sue will produce caps.
  - Would Sue and Tessa still be willing to trade 1 jacket for 15 caps? Explain your answer.**  
Sue and Tessa will not be willing to trade 1 jacket for 15 caps. In particular, Sue, whose comparative advantage lies in producing caps, can produce 1 jacket at an opportunity cost of only 10 caps. So Sue will be unwilling to pay any more than 10 caps per jacket.
9. "America's baby-boomers are embracing tea for its health benefits," said *The Economist* (July 8, 2005, p. 65). The article went on to say: "Even though the climate is suitable, tea-growing [in the United States] is simply too costly, since the process is labor-intensive and resists automation." Using this information:

- Sketch a PPF for the production of tea and other goods and services in India.**

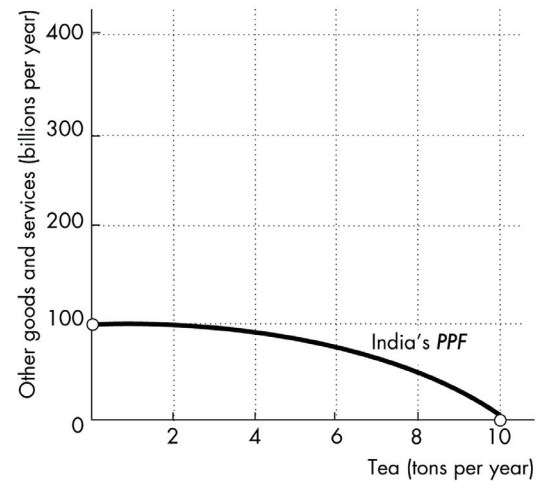
The PPF might be linear, though a more realistic PPF would be bowed out from the origin. The products along the two axes are tea and other goods and services. In Figure 2.5, tea is drawn along the horizontal axis but it could also be drawn along the vertical axis.

- Sketch a PPF for the production of tea and other goods and services in the United States.**

Again the PPF might be linear, though a more realistic PPF would be bowed out from the origin. As before, the products along the two axes are tea and other goods and services. Figure 2.6 (on the next page) illustrates the situation in the United States. Compared to India, the important point about the two PPFs is that the opportunity cost of producing tea is lower in India. If tea is measured along the horizontal axis, the magnitude of the slope of the PPF is equal to the

opportunity cost of producing tea, so in this case the U.S. PPF would be steeper than the Indian PPF. If tea is measured along the vertical axis, then the Indian PPF would be steeper than the U.S. PPF.

FIGURE 2.5  
Problem 9a



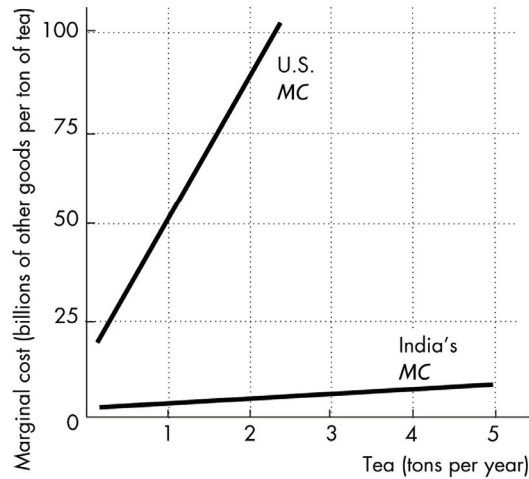
**c. Sketch a marginal cost curve for the production of tea in India.**

The marginal cost curve for producing tea in India is illustrated in Figure 2.7. This marginal cost curve slopes upward.

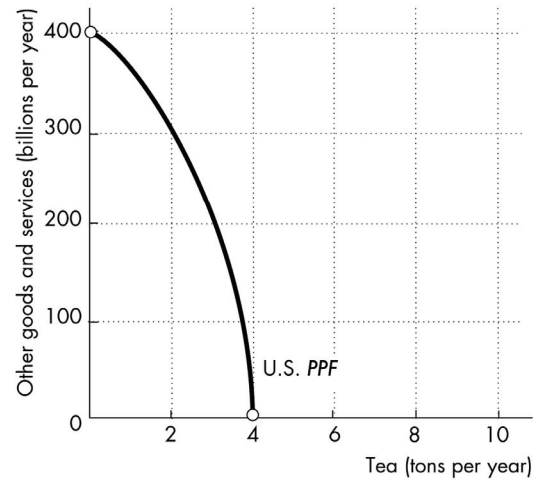
**d. Sketch a marginal cost curve for the production of tea in the United States.**

The marginal cost curve for producing tea in the United States is also illustrated in Figure 2.7. Similar to the marginal cost curve for India, the U.S. marginal cost curve slopes upward. Because tea is less costly to produce in India than in the United States, the U.S. *MC* curve lies above the Indian *MC* curve.

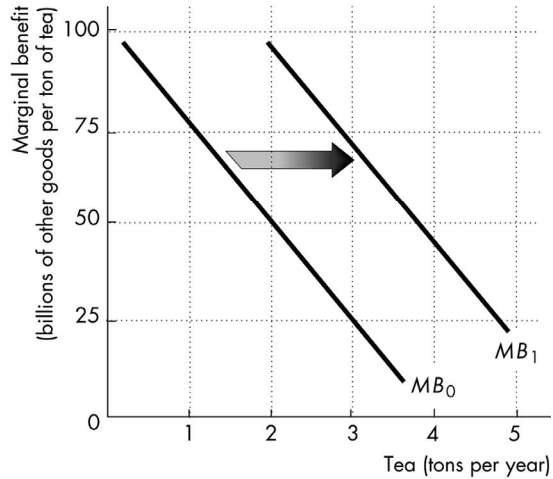
**FIGURE 2.7**  
**Problem 9c and 9d**



**FIGURE 2.6**  
**Problem 9b**



**FIGURE 2.8**  
**Problem 9e**



**e. Sketch the marginal benefit curve for tea in the United States before and after the baby boomers began to appreciate the health benefits of tea.**

As Figure 2.8 shows, the downward sloping marginal benefit curve for tea shifts rightward after more baby-boomers start to appreciate tea.

**f. Explain why the United States does not produce tea and instead imports it from India.**

The United States imports tea from India because it is cheaper for the U.S. to import tea than to produce it in the United States. Fewer other goods and services must be given up to import tea than would be given up if the United States produced tea.

**g. Explain how the quantity of tea that achieves allocative efficiency has changed.**

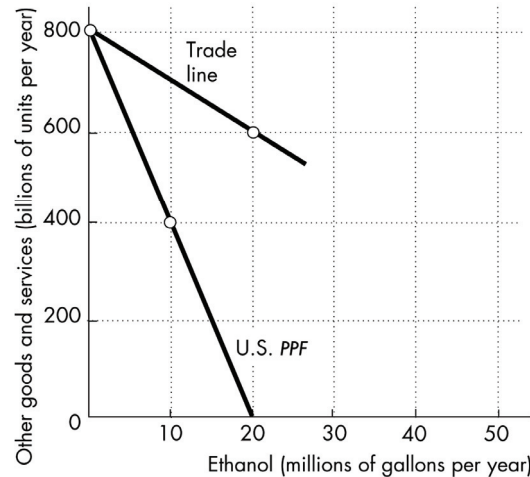
The increase in the marginal benefit from tea increases the quantity of tea that achieves allocative efficiency.

- e. **Does the change in preferences toward tea affect the opportunity cost of producing tea?**  
If the *PPF* in India between tea and other goods and services is bowed out from the origin, increasing the production of tea raises the opportunity cost of producing tea.

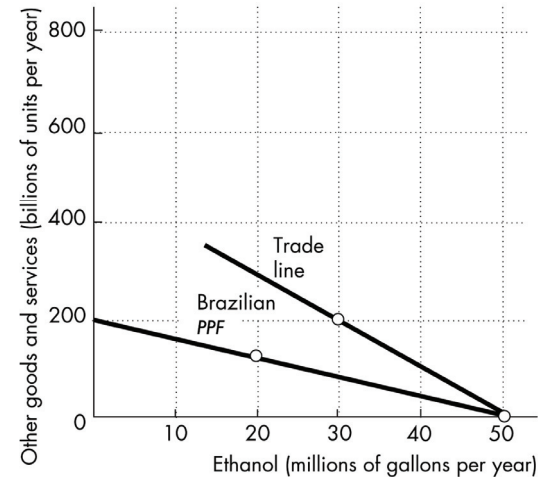
**10. Brazil produces ethanol from sugar at a cost of 83 cents per gallon. The United States produces ethanol from corn at a cost of \$1.14 per gallon. Sugar grown on one acre of land produces twice the quantity of ethanol as the corn grown on an acre. The United States imports 5 percent of its ethanol consumption and produces the rest itself. Since 2003, U.S. ethanol production has more than doubled and U.S. corn production has increased by 45 percent.**

- a. **Does Brazil or the United States have a comparative advantage in producing ethanol?**  
Brazil has a comparative advantage in producing ethanol. In Brazil \$0.83 worth of other goods and services must be forgone to produce a gallon of ethanol whereas in the United States \$1.14 of other goods and services must be forgone to produce a gallon of ethanol.
- b. **Do you expect the opportunity cost of producing ethanol in the United States to have increased since 2003? Explain why.**  
If there have been no technological changes in the production of ethanol, so that the *PPF* between ethanol and other goods and services has not shifted, then the opportunity cost of producing ethanol in the United States increased as more ethanol was produced.

**FIGURE 2.9**  
**Problem 10c**



**FIGURE 2.10**  
**Problem 10d**



- c. **Sketch the *PPF* for ethanol and other goods and services for the United States.**  
Figure 2.9 shows the U.S. *PPF*. For simplicity and in keeping with Figure 2.6 on p. 42 of the textbook, the *PPF* is linear.
- d. **Sketch the *PPF* for ethanol and other goods and services for Brazil.**  
Figure 2.10 shows the Brazilian *PPF*. For simplicity and in keeping with the Figure on p. 42 of the textbook, the *PPF* is linear.
- e. **Sketch a figure similar to Fig. 2.6 on p. 42 to show how both the United States and Brazil can gain from specialization and trade.**  
In general, the United States gains from trade with Brazil by importing ethanol from Brazil. Brazil produces ethanol at a lower opportunity cost than the United States, so the opportunity cost to the United

States of consuming ethanol is lower if the United States consumes ethanol produced in Brazil. In Figure 2.9 initially the United States produced and consumed 400 billion units of other goods and services and 10 million gallons of ethanol. After specializing in the production of other goods and services and trading with Brazil, the United States produces 800 billion units of other goods and services. By trading 200 billion units of goods and services for 20 million gallons of ethanol, the United States consumes 600 billion units of other goods and services and 20 million gallons of ethanol. The consumption of *both* other goods and services and ethanol increases in the United States. The story in Brazil is similar. In Figure 2.10 prior to trade Brazil produced and consumed billion units of other goods and services and 20 million gallons of ethanol. After specializing in the production of ethanol (50 million gallons of ethanol) and trading with the United States (20 million gallons of ethanol in exchange for 200 billion units of other goods and services) Brazil consumes 200 billion units of other goods and services and 30 million gallons of ethanol. The consumption of *both* other goods and services and ethanol increases in Brazil.

**f. Do you think the United States has achieved production efficiency in its manufacture of ethanol? Explain why or why not.**

The United States has probably attained production efficiency. In the United States firms have the incentive to produce goods and services, such as ethanol, efficiently because the owners of firms have been given the property right to their firm's profit.

**g. Do you think the United States has achieved allocative efficiency in its manufacture of ethanol? Explain why or why not.**

With the higher price of gasoline, the demand for ethanol and, as a result, the demand for the corn used to produce ethanol increased. The allocatively efficient quantity of both have increased. However the United States does not allow free trade in ethanol, which is why the U.S. price exceeds the Brazilian price. It is likely that the allocatively efficient quantity of U.S.-produced ethanol is less than the quantity actually produced in the United States. Most likely allocative efficiency requires that the United States should produce less ethanol, more other goods and services, and trade with Brazil because Brazil produces ethanol at lower cost than the United States.

**11. For 50 years, Cuba has had a centrally planned economy in which the government makes the big decisions on how resources will be allocated. Why would you expect Cuba's production possibilities (per person) to be smaller than those of the United States? What are the economic institutions that help the U.S. economy achieve allocative efficiency that Cuba might lack?**

Cuba's economy is almost surely less efficient than the U.S. economy. Because owners of firms in the United States have been given the property rights to any profit their firm might earn, owners have the self-interested incentive to operate the firm efficiently and produce goods and services that consumers desire. In Cuba these incentives are absent because firms are not privately owned. As a result, no single person has the self-interested incentive to either insure that firms produce goods and services efficiently or produce the goods and services that consumers desire. In other words, the U.S. economy with its property rights and markets has harnessed people's self interest to produce goods and services efficiently and so the U.S. economy is likely much closer to allocative efficiency than is the Cuban economy.

**12. Suppose that Yucatan's production possibilities are given in the table.**

**a. Draw a graph of Yucatan's PPF and explain how your graph illustrates a tradeoff.**

Yucatan's PPF is illustrated in Figure 2.11 (on the next page). The figure illustrates a tradeoff because moving along Yucatan's PPF producing more of one good requires producing less of the other good. Yucatan trades off more production of one good for less production of the other.

Food (pounds per month)	and	Sunscreen (gallons per month)
300	and	0
200	and	50
100	and	100
0	and	150

- b. **If Yucatan produces 150 pounds of food per month, how much sunscreen must it produce if it achieves production efficiency?**

If Yucatan produces 150 pounds of food per month, then the point labeled *A* on the *PPF* in Figure 2.11 shows that Yucatan must produce 75 gallons of sunscreen per month to achieve production efficiency.

- c. **What is Yucatan's opportunity cost of producing 1 pound of food?**

Yucatan's *PPF* is linear so the opportunity cost of producing 1 pound of food is the same at all quantities. Calculate the opportunity cost of producing 1 pound of food when moving from 0 to 100 pounds per month. Between these two ranges of production, the quantity of sunscreen produced falls from 150 gallons per month to 100 gallons per month, a decrease of 50 gallons. The opportunity cost is 50 gallons of sunscreen to gain 100 pounds of food. The opportunity cost per pound of food equals  $(50 \text{ gallons of sunscreen}) / (100 \text{ pounds of food})$ , or an opportunity cost of 0.5 gallons of sunscreen per pound of food.

- d. **What is Yucatan's opportunity cost of producing 1 gallon of sunscreen?**

Yucatan's *PPF* is linear so the opportunity cost of producing 1 gallon of sunscreen is the same at all quantities. Calculate the opportunity cost of producing 1 gallon of sunscreen moving from 0 to 50 gallons per month. Between these two ranges of production, the quantity of food produced falls from 300 pounds per month to 200 pounds per month, a decrease of 100 pounds. The opportunity cost is 100 pounds of food in order to gain of 50 gallons of sunscreen, or  $(100 \text{ pounds of food}) / (50 \text{ gallons of sunscreen})$  which yields an opportunity cost of 2.0 pounds of food per gallon of sunscreen.

- e. **What is the relationship between your answers to c and d?**

Answers c and d reflect the fact that opportunity cost is a ratio. The opportunity cost of gaining a unit of a product moving along the *PPF* equals the quantity of the other good or service forgone divided by the quantity of the good or service gained. The opportunity cost of one good, food, is equal to the inverse of the opportunity cost of the other good, sunscreen.

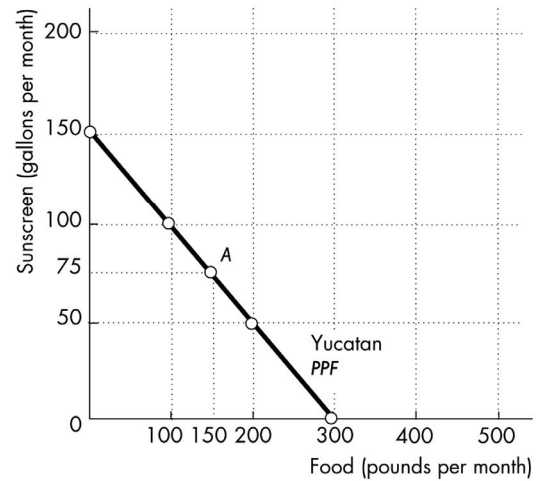
- f. **Does Yucatan face an increasing opportunity cost of food? What feature of a *PPF* illustrates increasing opportunity cost and why does the *PPF* that you have drawn not have this feature?**

Yucatan does not face an increasing opportunity cost of food because the opportunity cost remains constant, equal to 0.5 gallons of sunscreen per pound of food. If opportunity costs increase, the *PPF* bows outward. Yucatan's *PPF* is linear and along a linear *PPF* the opportunity cost is constant.

13. **What is the marginal cost of a pound of food in Yucatan in problem 12 when the quantity produced is 150 tons per day? What is special about the marginal cost of food in Yucatan?**

The marginal cost of a pound of food in Yucatan is constant at all points along Yucatan's *PPF* and is equal to 0.5 gallons of sunscreen per pound of food. The special point about Yucatan's marginal cost is the fact that the marginal cost is constant.

FIGURE 2.11  
Problem 12a



14. In Yucatan, which has the production possibilities shown in the table in problem 12, preferences are described by the table.

a. What is the marginal benefit from sunscreen, how it is measured?

The marginal benefit from sunscreen is the benefit enjoyed by the person who consumes one more gallon of sunscreen. It is equal to the willingness to pay for an additional gallon.

b. What information provided in the table above and the table in problem 12 do we need to be able to calculate the marginal benefit from sunscreen in Yucatan?

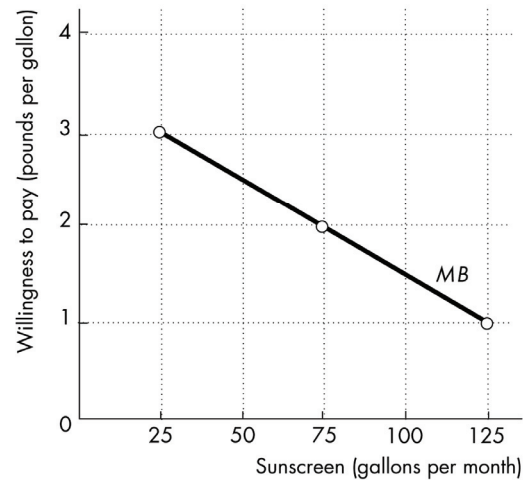
The table gives the information necessary to calculate the marginal benefit from sunscreen. The marginal benefit is equal to the willingness to pay for a gallon of sunscreen.

c. Draw a graph of Yucatan's marginal benefit from sunscreen.

To draw the marginal benefit from sunscreen, plot the quantity of sunscreen on the  $x$ -axis and the willingness to pay for sunscreen (that is, the number of pounds of food that they are willing to give up to get a gallon of sunscreen) on the  $y$ -axis. Figure 2.12 shows this figure.

Sunscreen (gallons per month)	and	Willingness to pay (pounds per gallon)
25	and	3
75	and	2
125	and	1

FIGURE 2.12  
Problem 14c



15. “Dr. Arata Kochi, the World Health Organization malaria chief, ... [says that] eradication is counterproductive. With enough money, he said, current tools like nets, medicines and DDT could drive down malaria cases 90 percent. ‘But eliminating the last 10 percent is a tremendous task and very expensive,’ Dr. Kochi said. ‘Even places like South Africa should think twice before taking this path.’”

*The New York Times*, March 4, 2008

a. Is Dr. Kochi talking about *production efficiency* or *allocative efficiency* or both?

Dr. Kochi is talking about allocative efficiency. His assessment is that the last 10 percent eradication has such a high marginal cost that it almost surely exceeds its marginal benefit.

b. Make a graph with the percentage of malaria cases eliminated on the  $x$ -axis and the marginal cost and marginal benefit of driving down malaria cases on the  $y$ -axis. On your graph:

- Draw a marginal cost curve that is consistent with Dr. Kochi's opinion reported in the news article.
- Draw a marginal benefit curve that is consistent with Dr. Kochi's opinion reported in

the news article.

(iii) Identify the quantity of malaria eradicated that achieves allocative efficiency.

Figure 2.13 shows a marginal cost curve and a marginal benefit curve that are consistent with Dr. Kochi’s views. The marginal cost curve rises rapidly after 90 percent of malaria is eradicated. The allocatively efficient quantity of malaria eradicated is 90 percent because that is the quantity for which the marginal benefit of eradication equals the marginal cost of eradication.

16. **Capital accumulation and technological change bring economic growth, which means that the PPF keeps shifting outward: Production that was unattainable yesterday becomes attainable today; and production that is unattainable today will become attainable tomorrow. Why doesn’t this process of economic growth mean that scarcity is being defeated and will one day be gone?**

Scarcity is always being defeated yet will never suffer defeat. Scarcity reflects the existence of unmet wants. People’s wants are infinite—regardless of what a person already possesses, everyone can easily visualize something else he or she wants, if only more time in the day to enjoy their possessions. Because people’s wants are insatiable, scarcity will always exist regardless of economic growth.

17. **“Inexpensive broadband access has done far more for online video than enable the success of services like YouTube and iTunes. By unchaining video watchers from their TV sets, it has opened the floodgates to a generation of TV producers for whom the Internet is their native medium.”**

- a. **How has inexpensive broadband changed the production possibilities of video entertainment and other goods and services?**

Inexpensive broadband has increased the production possibilities.

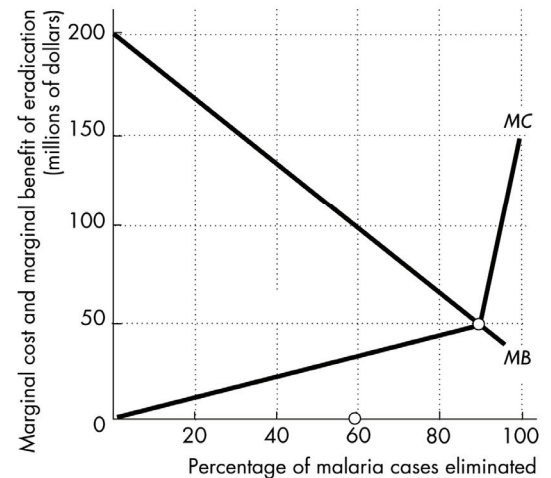
- b. **Sketch a PPF for video entertainment and other goods and services before broadband.**

The PPF should have video entertainment on one axis and other goods and services on the other as illustrated in Figure 2.14 by  $PPF_0$ . The PPF is bowed outward as a conventional PPF.

- c. **Show how the arrival of inexpensive broadband has changed the PPF.**

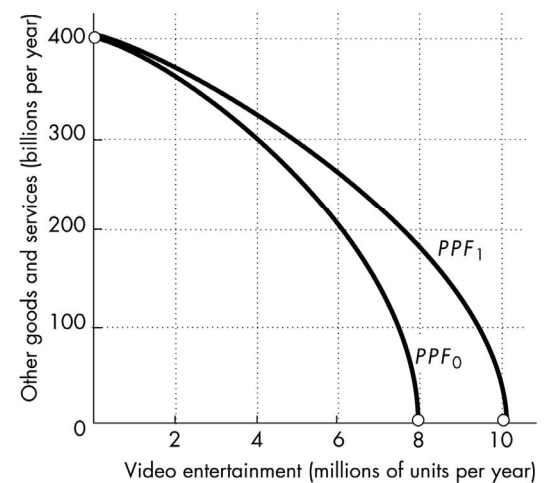
The arrival of inexpensive broadband shifts the PPF outward as shown by the change from  $PPF_0$  to  $PPF_1$  in Figure 2.14. The intersection of the new PPF along the axis measuring video entertainment

FIGURE 2.13  
Problem 15b



*The New York Times*, December 2, 2007

FIGURE 2.14  
Problem 17b and 17c





increases and the intersection of the new *PPF* along the axis measuring other goods and services does not change.

**d. Sketch a marginal benefit curve for video entertainment.**

The marginal benefit curve should be a conventional downward sloping marginal benefit curve as shown in Figure 2.15. The marginal benefit from video entertainment is measured along the vertical axis and the quantity of video entertainment is measured along the horizontal axis.

**e. Show how opening the “floodgates to a generation of TV producers for whom the Internet is their native medium” might have changed the marginal benefit from video entertainment.**

The marginal benefit curve does not shift because of “opening the floodgates” since this effect changes the marginal cost not the marginal benefit. The marginal cost curve shifts downward. However if there is increased excitement about this medium, then the marginal benefit increases and the marginal benefit curve shifts rightward. Then, as illustrated in Figure 2.16 the allocatively efficient quantity of video entertainment increases.

**f. Explain how the quantity of video entertainment that achieves allocative efficiency has changed.**

Because the marginal cost of providing video entertainment falls, the allocatively efficient quantity of video entertainment increases, in Figure 2.16 from 5 million units per year to 8 million units per year.

**18. Kim can produce 40 pies an hour or 400 cookies an hour. Liam can produce 100 pies an hour or 200 cookies an hour.**

**a. Calculate Kim’s opportunity cost of producing a pie.**

If Kim spends an hour baking pies, she gains 40 pies but forgoes 400 cookies. Kim’s opportunity cost of 1 pie is  $(400 \text{ cookies}) / (40 \text{ pies})$ , or 10 cookies per pie.

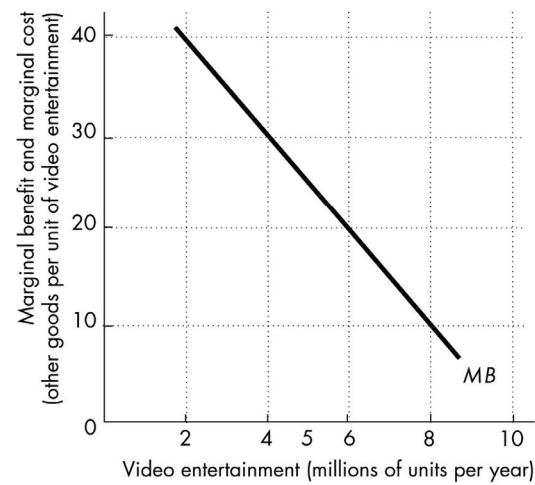
**b. Calculate Liam’s opportunity cost of producing a pie.**

If Liam spends an hour baking pies, he gains 100 pies but forgoes 200 cookies. Liam’s opportunity cost of 1 pie is  $(200 \text{ cookies}) / (100 \text{ pies})$ , or 2 cookies per pie.

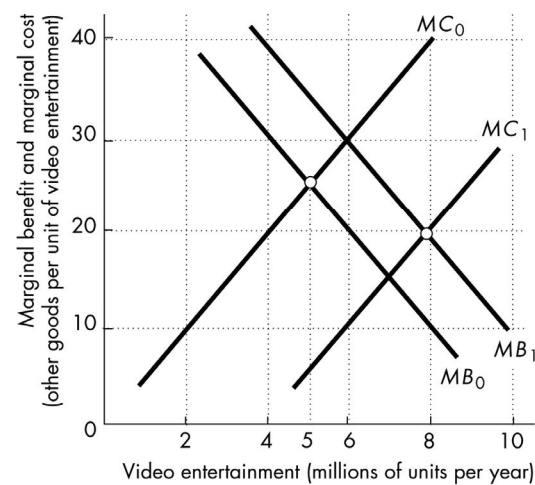
**c. Who has a comparative advantage in producing pies?**

Liam has the comparative advantage in producing pies because his opportunity cost of a pie is less than Kim’s opportunity cost.

**FIGURE 2.15**  
**Problem 17d**



**FIGURE 2.16**  
**Problem 17e and 17f**



- d. **If Kim and Liam spend 30 minutes of each hour producing pies and 30 minutes producing cookies, how many pies and cookies does each of them produce?**

Kim produces 20 pies and 200 cookies. Liam produces 50 pies and 100 cookies. The total number produced is 70 pies and 300 cookies.

- e. **Suppose that Kim and Liam increase the time they spend producing the good in which they have a comparative advantage by 15 minutes. What will be the increase in the total number of pies and cookies they produce?**

Kim spends her 15 minutes producing more cookies and Liam spends his 15 minutes producing pies. Kim produces 300 cookies and 10 pies, while Liam produces 75 pies and 50 cookies. The total number of pies and cookies produced is 85 pies and 350 cookies, an increase of 15 pies and 50 cookies over the situation described in part d.

- f. **What is the highest price of a pie at which Kim and Liam would agree to trade pies and cookies?**

Liam will trade pies to Kim in exchange for cookies. The highest price for a pie at which Kim is willing to trade is 10 cookies per pie. If the price were any higher, it would be cheaper for Kim if she produced her own pies. Kim will trade cookies to Liam in exchange for pies. The highest price for a cookie at which Liam is willing to trade is 0.5 pies per cookie. (This price is Liam's opportunity cost of a cookie.) If the price were any higher, it would be cheaper for Liam if he produced her own cookies.

- g. **If Kim and Liam specialize and trade, what are the gains from trade?**

Kim will specialize in cookies and Liam will produce pies. If they specialize and trade, the total production of both cookies and pies increase. This increase is the gains from trade.

19. **Before the Civil War, the South traded with the North and with England. The South sold cotton and bought manufactured goods and food. During the war, one of Lincoln's first actions was to blockade the ports, which prevented this trade. The South had to increase its production of munitions and food.**

- a. **In what did the South have a comparative advantage?**

Before the war the South had a comparative advantage in producing cotton.

- b. **Draw a graph to illustrate production, consumption, and trade in the South before the Civil War.**

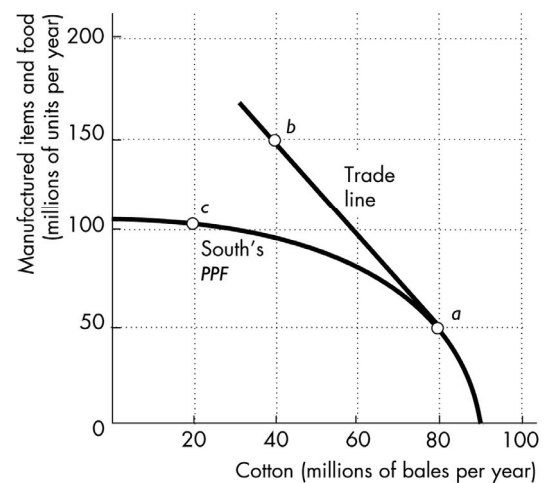
Figure 2.17 illustrates the South's situation. The production point is point *a*. The South produces a great deal of cotton and very little food and manufactured goods; indeed, in the unlikely case that the South completely specialized, the production point could be at the maximum quantity of cotton and zero food and manufactured goods. From the production point a trade line with a negative slope touches the PPF and extends beyond the PPF. The trade line shows that the South traded cotton for manufacturing goods and food and consumed at point *b*, well beyond its PPF.

- c. **Was the South consuming inside, on, or outside its PPF? Explain your answer.**

The South was consuming at a point beyond its PPF. The South could do so because it was able to trade cotton, which was relatively less expensive for

FIGURE 2.17

Problem 19



the South to produce, in exchange for manufactured goods and food, which would have been relatively expensive for the South to produce. In other words, the South enjoyed gains from trade.

**d. Draw a graph to show the effects of the Civil War on consumption and production in the South.**

Assuming that the Civil War did not affect the South's *PPF* (which is probably true only for the first part of the war) the North's blockade meant that the South could no longer trade with others. As a result, the South increased its production of manufactured goods (especially munitions) and food, which caused the South to decrease its production of cotton. The blockade forced the South's consumption point to lie on its *PPF*, so the South's consumption of manufactured goods and food decreased. In Figure 2.17, the South changes so that its production and its consumption point become point *c*.

**e. Did the Civil War change any opportunity costs in the South? Did the opportunity cost of everything rise? Did any items cost less?**

The Civil War increased the opportunity cost of food and manufactured goods. However it decreased the opportunity cost of cotton.

**f. Illustrate your answer to e with appropriate graphs.**

Figure 2.17 illustrates the changes. The opportunity cost of cotton decreased because the blockade led the South to produce less cotton, moving from initial production point *a* to final production point *c*. Moving along a *PPF*, as less of a good is produced, its opportunity cost falls. The opportunity cost of food and manufactured goods increased because the South increased the amount of food and manufactured goods it produced. Moving along a *PPF*, as more of a good is produced, its opportunity cost rises.

**20. "A two-time N.B.A. All-Star, Barron Davis has quietly been moonlighting as a [movie] producer since 2005, when he and a high school buddy, Cash Warren, formed a production company called Verso Entertainment. In January, Verso's first feature-length effort, "Made in America," a gang-life documentary directed by Stacy Peralta, had its premiere to good reviews at Sundance Film Festival and is being courted by distributors."**

*The New York Times*, February 24, 2008

**a. Does Barron Davis have an *absolute* advantage in basketball and movie directing and is this the reason for his success in both activities?**

Mr. Davis might have an absolute advantage in both endeavors. His success, however, is the result of his comparative advantage in both.

**b. Does Barron Davis have a comparative advantage in basketball or movie directing or both of them and is this the reason for his success in both activities?**

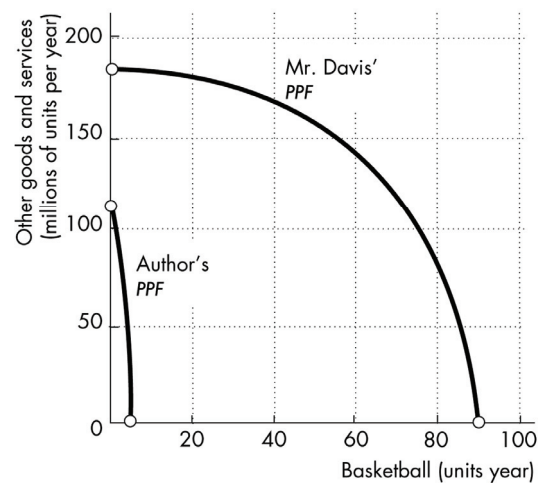
Mr. Davis has many activities available, so he might have a comparative advantage in both basketball and directing. Mr. Davis, however, will *not* have a comparative advantage in all the other activities.

**c. Sketch a *PPF* between playing basketball and producing other goods and services for Barron Davis and for yourself.**

Figure 2.18 shows a typical set of *PPFs*. Unless the student is a future NBA superstar, the *PPF* for Mr. Davis will definitely intersect the axis that measures playing basketball much farther away from the origin than the student's *PPF*. The intersection of the *PPF* and the axis that measures the production

FIGURE 2.18

Problem 20c



of other goods might be higher for Mr. Davis or might be higher for the student (depending on the student's ego). But the student's *PPF* will be steeper than Mr. Baron's *PPF*, indicating that the opportunity cost of producing units of basketball is lower for Mr. Davis than for the student.

**d. How do you (and people like you) and Barron Davis (and people like him) gain from specialization and trade?**

Mr. Davis will specialize in the activity in which he has a comparative advantage, possibly playing basketball. Other people will specialize in the activities in which they have comparative advantages. As a result, production of all goods and services takes place at the lowest opportunity costs. Then all these low-cost producers can trade with everyone else, so that everybody can enjoy a richer and more complex consumption bundle acquired at lower cost than if the goods and services were produced by the person himself or herself.

**21. After you have studied *Reading Between the Lines* on pp. 46–47, answer the following questions:**

**a. How has an Act of the United States Congress increased U.S. production of corn?**

The Act of Congress increased the amount of ethanol that must be used in gasoline. Because ethanol is made from corn, the mandate increased the demand for corn and farmers responded by growing more corn.

**b. Why would you expect an increase in the quantity of corn produced to raise the opportunity cost of corn?**

Increasing the quantity of corn produced results in a higher opportunity cost of corn because acreage less suited to growing corn is shifted away from other crops and into corn. As increasingly less suitable acreage is used, the opportunity cost of in terms of other crops forgone increases.

**c. Why did the cost of producing corn increase in the rest of the world?**

The cost of producing corn in the rest of the world increased for two reasons. First in other parts of the world, droughts decreased the corn harvest and thereby increased the opportunity cost of the land that was being used to grow corn. Second the increased demand for corn from people who had previously been destitute increased the land devoted to growing corn, which also raised the opportunity cost of producing corn.

**d. Is it possible that the increased quantity of corn produced, despite the higher cost of production, moves the United States closer to allocative efficiency?**

It is possible that the increased quantity of corn has moved the United States closer to allocative efficiency. The marginal benefit from ethanol increased because of the higher price for gasoline, so the allocatively efficient quantity of ethanol increased. To increase the production of ethanol more corn had to be produced, so even with the higher opportunity cost, the United States might have moved closer to the allocatively efficient point of production.

22. Use the links on MyEconLab (Textbook Resources, Chapter 2, Weblinks) to obtain data on the tuition and other costs of enrolling in the MBA program at a school that interests you.
- a. Draw a *PPF* that shows the tradeoff that you would face if you decided to enroll in the MBA program.

The *PPF* a student draws should be similar to Figure 2.19. The *PPF* should show the quantity of consumption goods and services on one axis and the quantity of education goods and services on the other axis and should be bowed out from the origin.

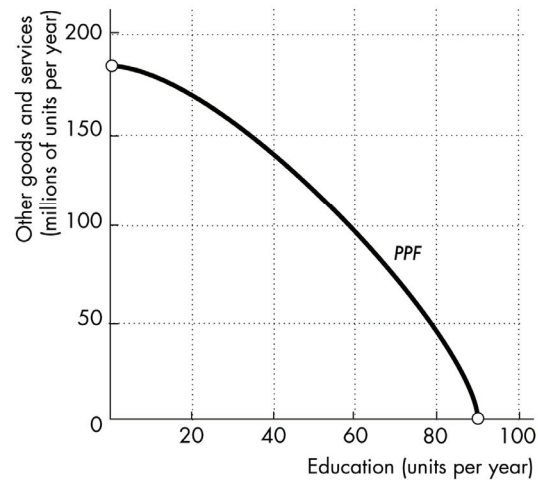
- b. Do you think your marginal benefit of an MBA exceeds your marginal cost?

Whether a particular student believes that the marginal benefit of an MBA exceeds his or her marginal cost depends on the marginal cost of the MBA program the student selected and the student's marginal benefit, such as expected future jobs, of an MBA degree from that program.

- c. Based on your answer to b, do you plan to enroll in an MBA program? Is your answer to this question consistent with using your time to achieve your self-interest?

The student should plan to enroll in an MBA program if the marginal benefit (to the student) exceeds the marginal cost (to the student). This decision will be made on the basis of furthering the student's self interest.

FIGURE 2.19  
Problem 22a



## Additional Problems

1. Jane's Island's production possibilities are given in the table to the right.
  - a. Draw a graph of the production possibility frontiers on Jane's Island.
  - b. What are Jane's opportunity costs of producing corn and cloth at each output in the table?
2. In problem 1, Jane is willing to give up 0.75 pounds of corn per yard of cloth if she has 2 yards of cloth; 0.50 pounds of corn per yard of cloth if she has 4 yards of cloth; and 0.25 pound of corn per yard of cloth if she has 6 yards of cloth.
  - a. Draw a graph of Jane's marginal benefit from corn.
  - b. What is Jane's efficient quantity of corn?
3. Joe's production possibilities are given in the table to the right. What are Joe's opportunity costs of producing corn and cloth at each output in the table?
4. In problems 1 and 2, Jane's Island produces and consumes 2 pounds of corn and 2 yards of cloth. Joe's Island produces and consumes 2 pounds of corn and 2 yard of cloth. Now the islands begin to trade.
  - a. What good does Jane sell to Joe and what good does Jane buy from Joe?
  - b. If Jane and Joe divide the total output of corn and cloth equally, what are the gains from trade?

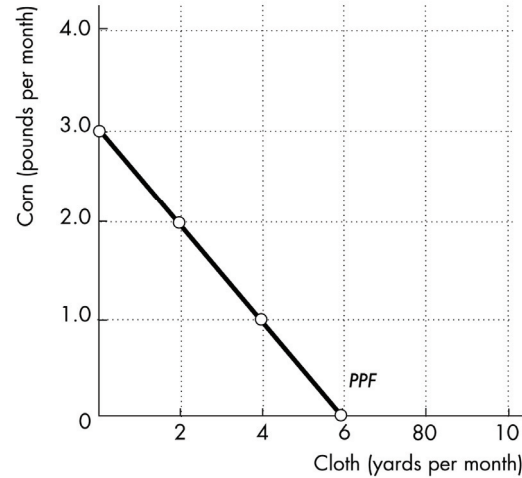
Corn (pounds per month)	and	Cloth (yards per month)
3.0	and	0
2.0	and	2
1.0	and	4
0	and	6

Corn (pounds per month)	and	Cloth (yards per month)
6	and	0
4	and	1.0
2	and	2.0
0	and	3.0

## Solutions to Additional Problems

1. a. Jane's Island's *PPF* is a straight line. To make a graph of Jane's Island's *PPF* measure the quantity of one good on the *x*-axis and the quantity of the other good on the *y*-axis. Plot the quantities in each row of the table. Figure 2.20 illustrates Jane's Island's *PPF*.

FIGURE 2.20  
Additional problem 1a



- b. The opportunity cost of 1 pound of corn is 2 yards of cloth. The opportunity cost of the first pound of corn is 2 yards of cloth. To find the opportunity cost of the first pound of corn, increase the quantity of corn from 0 pounds to 1 pound. In doing so, Jane's Island's production of cloth decreases from 6 yards to 4 yards. The opportunity cost of the first pound of corn is 2 yards of cloth. Similarly, the opportunity costs of producing the second pound and the third pound of corn are 2 yards of cloth. The opportunity cost of 1 yard of cloth is 0.5 pound of corn. The opportunity cost of producing the first 2 yards of cloth is 1 pound of corn. To calculate this opportunity cost, increase the quantity of cloth from 0 yards to 2 yards. Jane's Island's production of corn decreases from 3 pounds to 2 pounds. Similarly, the opportunity cost of producing the second 2 yards and the third 2 yards of cloth are 1 pound of corn.
2. a. The marginal benefit curve slopes downward. To draw the marginal benefit curve from cloth, plot the quantity of cloth on the *x*-axis and the willingness to pay for cloth (that is, the number of pounds of corn that Jane is willing to give up to get a yard of cloth) on the *y*-axis.
- b. The efficient quantity is 4 yards a month. The efficient quantity to produce is such that the marginal benefit from the last yard equals the opportunity cost of producing it. The opportunity cost of a yard of cloth is 0.5 pound of corn. The marginal benefit of the fourth yard of cloth is 0.5 pound of corn. And the marginal cost of the fourth yard of cloth is 0.5 pound of corn.
3. Joe's Island's opportunity cost of a pound of corn is 1/2 yard of cloth, and its opportunity cost of a yard of cloth is 2 pounds of corn. When Joe's Island increases the corn it produces by 2 pounds a month, it produces 1 yard of cloth less. The opportunity cost of 1 pound of corn is 1/2 yard of cloth. Similarly, when Joe's Island increases the cloth it produces by 1 yard a month, it produces 2 pounds of corn less. The opportunity cost of 1 yard of cloth is 2 pound of corn.
4. a. Jane's Island sells cloth and buys corn. Jane's Island sells the good in which it has a comparative advantage and buys the other good from Joe's Island. Jane's Island's opportunity cost of 1 yard of cloth is 1/2 pound of corn, while Joe's Island's opportunity cost of 1 yard of cloth is 2 pounds of corn. Jane's Island's opportunity cost of cloth is less than Joe's Island's, so Jane's Island has a comparative advantage in producing cloth. Jane's Island's opportunity cost of 1 pound of corn is 2 yards of cloth, while Joe's Island's opportunity cost of 1 pound of corn is 1/2 yard of cloth. Joe's Island's opportunity cost of corn is less than Jane's Island's, so Joe's Island has a comparative advantage in producing corn.
- b. With specialization and trade, together they can produce 6 pounds of corn and 6 yards of cloth and each will get 3 pounds of corn and 3 yards of cloth—an additional 1 pound of corn each and an additional 1 yard of cloth each. Hence the total gains from trade are 2 yards of cloth and 2 pounds of corn.