Chapter 1

5. Cost of Sochi Winter Olympics

The Russian government spent $6.7 billion on Olympic facilities and $16.7 billion upgrading Sochi area infrastructure. Sponsors spent $27.6 billion on hotels and facilities hoping to turn Sochi into a year-round tourist magnet.

Source: *The Washington Post*, February 11, 2014

Was the opportunity cost of the Sochi Olympics $6.7, $23.4, or $51 billion? Explain your answer.

The $6.7 billion spent on Olympic facilities is definitely an opportunity cost of the Sochi Olympics. The $16.7 billion spent upgrading the Sochi area infrastructure and the $27.6 billion spent on hotels and facilities are an opportunity cost of the Sochi Olympics *if* the funds would not have spent otherwise. However, if there were already plans underway to upgrade the Sochi area infrastructure then the cost is not an opportunity cost of the Sochi Olympics because the cost would have been paid even if Sochi did not host the Olympics. Similarly, if there were already plans underway to build hotels and facilities in Sochi then the cost is not an opportunity cost of the Sochi Olympics because the cost would have been paid even if Sochi did not host the Olympics.

Chapter 2

8. 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 jackets)/(40 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 jackets)/(80 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 they have 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 jacket)/(15 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.

9. 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.)
   a. 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 caps)/(4 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 caps)/(20 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.

b. 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.

c. 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.

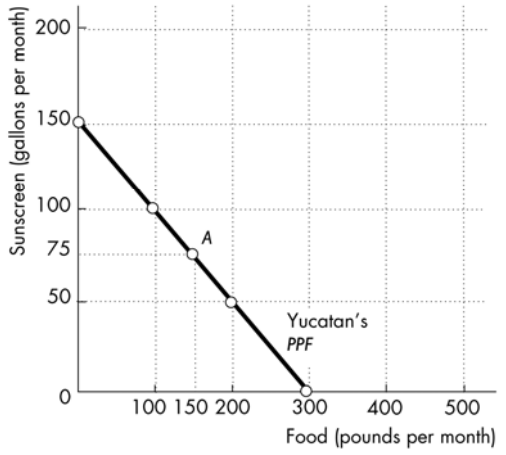
Use the table to work Problems 11 and 12. Suppose that Yucatan's production possibilities are given in the table.

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

Yucatan's *PPF* is illustrated in Figure 2.3. 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.

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

FIGURE **2.3**
Problem 11a



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 (i) 1 pound of food and (ii) 1 gallon of sunscreen?

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 increasing the production of food 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 gallons of sunscreen)/(100 pounds of food), or an opportunity cost of 0.5 gallon of sunscreen per pound of food.

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 when increasing the production of sunscreen 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 to gain 50 gallons of

sunscreen, or (100 pounds of food)/(50 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 part (c)?

Answers (c) and (d) reflect the fact that opportunity cost is a ratio. The opportunity cost of gaining a unit of a good 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.

12. What feature of a *PPF* illustrates increasing opportunity cost? Explain why Yucatan's opportunity cost does or does not increase.

If opportunity costs increase, the *PPF* bows outward. Yucatan's *PPF* is linear and along a linear *PPF* the opportunity cost is constant. 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. Yucatan's resources must be equally productive in both activities.

13. In problem 11, what is the marginal cost of 1 pound of food in Yucatan when the quantity produced is 150 pounds 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. This result reflects Yucatan's linear *PPF*.

14. The table describes the preferences in Yucatan.

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

a. What is the marginal benefit from sunscreen and how is it 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. For example, in the table when 75 gallons of sunscreen are produced, the marginal benefit of a gallon is 2 pounds of food per gallon.

b. Use the table in Problem 11. What does Yucatan produce to achieve allocative efficiency?

To achieve allocative efficiency, the marginal benefit of a gallon of sunscreen must equal the marginal cost of a gallon of sunscreen. Yucatan's marginal cost of a gallon of sunscreen is 2 pounds of food per gallon. When Yucatan produces 75 gallons of sunscreen, the table shows that Yucatan's marginal benefit is 2 pounds of food per gallon. Therefore allocative efficiency is achieved when 75 gallons of sunscreen and, from the *PPF*, 150 pounds of food are produced.

15. **Sales of Digital Movies Surge**

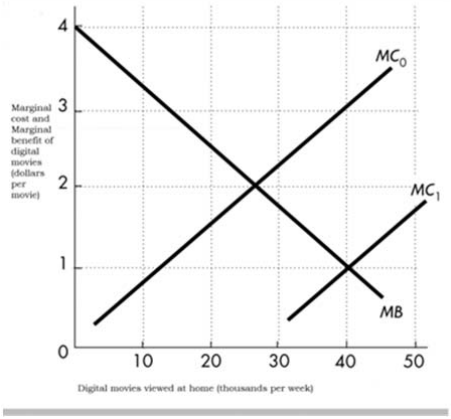
The U.S. home entertainment market is changing; online movie sales have surged to a significant proportion, while sales and rentals of physical discs are declining.

Source: *The Wall Street Journal*, January 7, 20147

a. Draw the PPF curves for online movie sales before and after the Internet became available.

Before the availability of Internet, there were no online movie sales and the production possibilities frontier was PPF_0 in Figure 2.4. After the Internet was developed, several companies started selling movies online. The Internet is a technological advance that rotates the production possibilities frontier outward to PPF_1 in Figure 2.4.

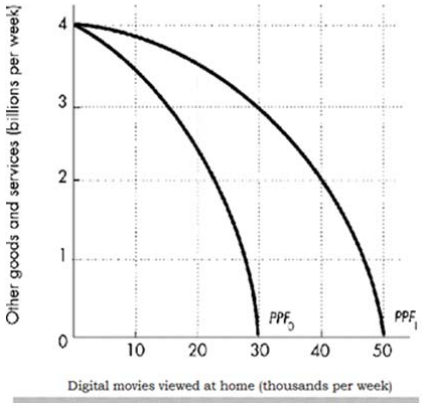
FIGURE **2.5**
Problem 15b



b. Draw the marginal cost and marginal benefit curves for physical disc retailers and online movie retailers before and after the Internet became available.

Online movie retailers have a lower marginal cost of delivering digital movies than do physical disc retailers. The marginal benefit for digital movie is the same regardless of whether the movie is bought online or from a physical disc retailer. Therefore in Figure 2.5, the marginal benefit curve for digital movies is *MB*, the marginal cost of physical disc retailers is MC_0 and the marginal cost of online movie sales is MC_1.

FIGURE **2.4**
Problem 15a



c. Explain how changes in production possibilities, preferences or both have changed the way digital movies are retailed.

The change in production possibilities, which has created online digital movie stores such as iTunes, has changed the way digital movies are purchased. Because the marginal cost of buying movies is less using an online store, and also because of easy and early availability of digital movies on online stores, today purchasing movies online is preferred. Consequently, sales and rentals of physical discs are declining.

Use the following news clip to work Problems 16 and 17.

Malaria Eradication Back on the Table

In response to the Gates Malaria Forum in October 2007, countries are debating the pros and cons of eradication. Dr. Arata Kochi of the World Health Organization believes that with enough money malaria cases could be cut by 90 percent, but it would be very expensive to eliminate the remaining10 percent of cases, so countries should not strive to eradicate malaria.

Source: *The New York Times*, March 4, 2008

16. 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.

17. 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:

(i) Draw a marginal cost curve and marginal benefit curve that are consistent with Dr. Kochi's opinion.

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

FIGURE **2.6**
Problem 17

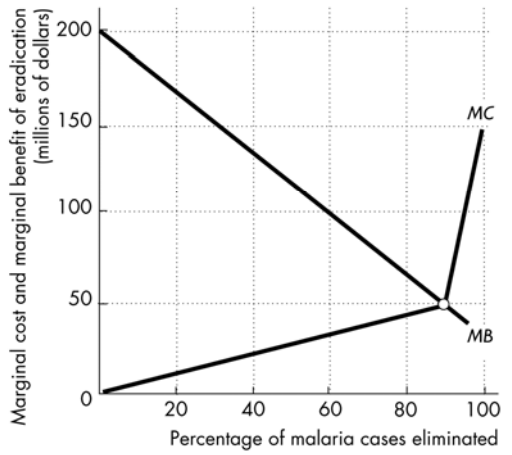


Figure 2.6 shows a marginal cost curve and a marginal benefit curve that are consistent with Dr. Kochi's views. Dr. Kochi believes that the last 10 percent of malaria would be very expensive to eradicate. The marginal cost curve in the figure reflects this view because the marginal cost curve rises rapidly after 90 percent of malaria is eradicated. The marginal benefit curve is downward sloping, reflecting diminishing marginal benefit from malaria eradication. 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. This outcome demonstrates Dr. Kochi's conclusion that countries should not attempt to completely

Use the following data to work Problems 20 and 21.
Kim can produce 40 pies or 400 cakes an hour. Liam can produce 100 pies or 200 cakes an hour.

20. a. Calculate Kim's opportunity cost of a pie and Liam's opportunity cost of a pie.

If Kim spends an hour baking pies, she gains 40 pies but forgoes 400 cakes. Kim's opportunity cost of 1 pie is (400 cakes)/(40 pies), or 10 cakes per pie. If Liam spends an hour baking pies, he gains 100 pies but forgoes 200 cakes. Liam's opportunity cost of 1 pie is (200 cakes)/(100 pies), or 2 cakes per pie.

b. If each spends 30 minutes of each hour producing pies and 30 minutes producing cakes, how many pies and cakes does each produce?

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

c. Who has a comparative advantage in producing (i) pies and (ii) cakes?

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

21. a Draw a graph of Kim's *PPF* and Liam's *PPF* and show the point at which each produces when they spend 30 minutes of each hour producing pies and 30 minutes producing cakes.

FIGURE **2.8**
Problem 21a

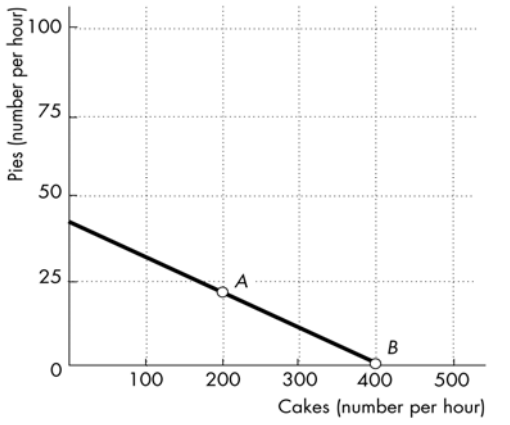
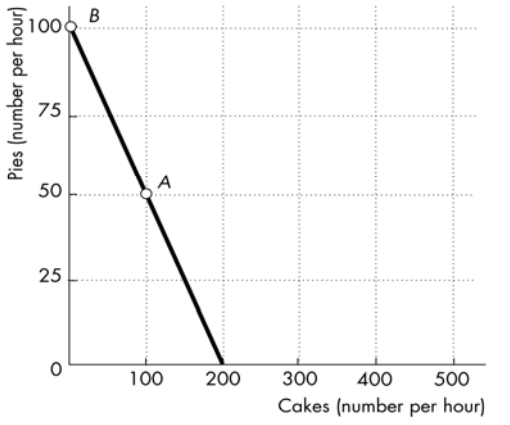


FIGURE **2.9**
Problem 21a



Kim's *PPF* is illustrated in Figure 2.8; Liam's *PPF* is illustrated in Figure 2.9.
Point *A* in both figures shows their production points when each spends 30 minutes making cakes and 30 minutes making pies.

b. On your graph, show what Kim produces and what Liam produces when they specialize.

Kim will specialize in cakes and Liam will specialize in pies. Point *B* in both figures shows the production points when each specializes.

c. When they specialize and trade, what are the total gains from trade?

Kim will specialize in cakes and Liam will specialize in pies. If they specialize and trade, the total production of *both* cakes and pies increase. When each spends 30 minutes making cakes and 30 minutes making pies, together they produce 300 cakes and 70 pies. When they specialize, together they produce 400 cakes and 100 pies. The 100 increase in cakes and the 30 increase pies is the gains from trade.

d. If Kim and Liam share the total gains equally, what trade takes place between them?
Kim will trade 50 cakes (half of the gain in cake production) to Liam in exchange for 15 pies (half of the increase in pie production).

Tony's Production Possibilities

Snowboards (units per week)		Skis (units per week)
25	and	0
20	and	10
15	and	20
10	and	30
5	And	40
0	And	50

Patty's Production Possibilities

Snowboards (units per week)		Skis (units per week)
20	and	0
10	and	5
0	and	10