Microeconomics Canada in the Global Environment (Canadian) 11th edition Parkin Solutions Manual

SKU: 9780136691839-SOLUTIONS

SOLUTIONS MANUAL

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Microeconomics
Eleventh Edition

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ISBN: 978-0-13-6691716

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PREFACE

Introduction

At no time in history has teaching the principles of economics been either more challenging or more important. Your decision to adopt the Eleventh Edition of our textbook brings to your task a set of teaching and learning tools that are unmatched in their clarity, relevance, and currency. It is our hope that with the help of these tools you will enable your students to become as excited about economics as you are.

This Solutions Manual reproduces all the "Review Quiz" questions and end-of-chapter "Study Plan Problems and Applications" and "Additional Problems and Applications" along with their solutions. If you are working through the questions and answers in class you will no longer need to turn from the textbook for the questions to this book for the answers: This Solutions Manual has *both*.

You can use these solutions to help you grade problems you have assigned or photocopy them and hand them out directly to the students.

All the questions in the textbook and this Solutions Manual are also in MyLab Economics, so if you prefer you can assign the questions online and have them graded automatically and captured in the grade book.

Whether you're teaching the principles course for the first time or are an experienced instructor at this level, we hope you will find this manual helpful. We wish you success and enjoyment in your course!

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Chapter 1

WHAT IS ECONOMICS?

Answers to the Review Quizzes

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1. List some examples of the scarcity that you face.

Examples of scarcity common to students include not enough income to afford both tuition and a car, not enough learning capacity to study for both an economics exam and a chemistry exam in one night, and not enough time to allow for extensive studying and extensive socializing.

2. Find examples of scarcity in today's headlines.

Scarcity is our inability to satisfy all our wants. An example of scarcity is the headline on *www.cbc.ca* on March 30, 2020, which states "Farmers concerned about disruptions to spring seeding, livestock operations amid COVID-19." Farmers are preparing to plant their crops, and supply disruptions mean that farmers are unable to plant all the crops that they want. Farmers also want to hire foreign workers to help on livestock farms but a scarcity of foreign workers means that they can't hire the number of workers that they want. Farmers face scarcity.

3. Find an example of the distinction between microeconomics and macroeconomics in today's headlines.

Microeconomics: On March 30, 2020, a headline in *The Globe and Mail* was "For graduating students, high anxiety as COVID-19 decimates job market." This story covers a microeconomic topic because it discusses choices made by students and businesses, and how they interact in the labour market.

Macroeconomics: On March 30, 2020, a headline in *The Globe and Mail* was "Canadian dollar weakens over 1 per cent as oil prices slide." This story covers a macroeconomic topic because it concerns the effect of performances of the Canadian and world economy on the Canadian dollar.

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1. Describe the broad facts about *what*, *how*, and *for whom* goods and services are produced.

What we produce varies over time. In Canada today, services account for 70 percent of production, manufactured goods for 28 percent, and agriculture for 2 percent. *What* we produce also varies over countries. Agriculture and manufacturing are small percentages of production in rich countries and large percentages of production in poorer countries.

How goods and services are produced is by businesses determining how the factors of production, land, labour, capital, and entrepreneurship, are combined to make the goods and services we consume. Land includes all natural resources, both renewable natural resources such as wood, and nonrenewable natural resources such as natural gas. The quality of labour depends on human capital. In Canada in 2020, 28 percent of the adult population had a

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university degree, a further 37.6 percent had some post-secondary education, and 95.7 percent had completed high school.

For whom goods and services are produced depends on the incomes that people earn. People with large incomes can buy a wide range of goods and services. People with small incomes can afford a smaller range of goods and services.

2. Use headlines from the recent news to illustrate the potential for conflict between self-interest and the social interest.

One example of an issue that illustrates the potential for conflict between self-interest and the social interest is the proposed Trans Mountain Pipeline. In the *Financial Post* on January 20, 2020, the headline "Supreme Court dismisses B.C. case against Trans Mountain Pipeline" appears. The potential for conflict exists between the self-interest of the potential workers whose employment is being delayed or possibly eliminated and the social interest of those concerned about the environment.

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1. Explain the idea of a tradeoff and think of three tradeoffs that you have made today.

A tradeoff is an exchange—giving up one thing to get something else. What is given up is the opportunity cost of whatever is obtained. Three examples of tradeoffs are: a) When a student sleeps in rather than attending his early morning economics class, the student trades additional sleep for study time. The opportunity cost of the decision is the difference between the A and the C he receives on the exam. b) When a student running late for class parks her car illegally, the student trades saving time for the risk of a ticket. The potential opportunity cost of the decision is the goods and services that cannot be purchased if the student receives an expensive parking ticket. c) A student trades higher income by spending time during the day working at a part-time job for less time spent at leisure. The opportunity cost of the higher income is the leisure time given up.

2. Explain what economists mean by rational choice and think of three choices that you've made today that are rational.

A rational choice is one that compares the costs and benefits and achieves the greatest benefit over cost for the person making the choice. Three rational choices are: a) The choice to skip breakfast to go to class. In this case the benefit is the higher grade in the class and the cost is the breakfast forgone. b) The choice to stop talking with a friend on the phone and start studying for an impending exam. In this case the benefit is the resulting higher grade in the class and the cost is the conversation forgone. c) The choice to do laundry today rather than watch television. In this case the benefit is clean clothes to wear and the cost is the loss of the entertainment the television show would have provided.

3. Explain why opportunity cost is the best forgone alternative and provide examples of some opportunity costs that you have faced today.

When a decision to undertake one activity is made, often many alternative activities are no longer possible. Often these activities are mutually exclusive so only the highest-valued alternative is actually forgone. For instance, the decision to go to a student's 8:30 AM class eliminates the possibility of sleeping in during the hour and of jogging during the hour. But in this case, it is impossible to *both* sleep in and to jog during the hour, so the opportunity cost of attending class cannot be both activities. The opportunity cost of attending class is *only* the activity that otherwise would have been chosen—*either* sleeping in *or* jogging—whatever activity is the most highly valued of the forgone alternatives.

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4. **Explain what it means to choose at the margin and illustrate with three choices at the margin that you have made today.**

   Choosing at the margin means choosing to do a little more or a little less of some activity. Three examples are: a) When a student faces a chemistry and an economics final exam in one day, the student must determine whether spending the last hour studying a little more chemistry or a little more economics will yield a better contribution (marginal benefit) to his overall GPA. b) A student buying a computer must decide whether the marginal benefit of adding 1 GB of additional memory is worth the marginal cost of the additional memory. c) A student football fan with a choice of a cheap seat in the student bleachers located at the far end of the playing field or a more expensive seat located on the 30 yard line must determine whether the marginal benefit of watching the game in a better seat is worth the marginal cost of the higher ticket price.

5. **Explain why choices respond to incentives and think of three incentives to which you have responded today.**

   People making rational decisions compare the marginal benefit of an action to its marginal cost. A person's choice changes when the incentive—the marginal benefit or the marginal cost changes. Examples of incentives are: a) A student studies because of the incentives offered by grades. b) A student is more likely to attend a class if attendance is factored into the grade. c) A student might attend a meeting of a club if the student's significant other is eager to attend the meeting.

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1. **Distinguish between a positive statement and a normative statement and provide examples.**

   A *positive* statement is about what *is.* It is testable. A *normative* statement is about what *ought to be*. It is not testable because there is no universally approved criterion by which the statement can be judged. "I will receive an A for this course," is a positive statement made by an economics student—it might not be true, but it is testable. "I will receive a good grade for this course," is a normative statement. Whether someone agrees with it depends on his interpretation of what makes for a "good" grade.

2. **What is a model? Can you think of a model that you might use in your everyday life?**

   A *model* is a description of some aspect of the world. An economic model is a description of some aspect of the economic world that includes only those features that are needed for the purpose at hand. An example of a model is a GPS map. It reflects only those aspects of the real world that are relevant to the user in reaching her destination and avoids information irrelevant to travel.

3. **How do economists try to disentangle cause and effect?**

   Economists disentangle cause and effect by using natural experiments (situations in the ordinary course of economic life in which the one factor of interest is different and other things are equal or similar); conducting statistical investigations to find correlations; and performing economic experiments by putting people in decision-making situations and varying the influence of one factor at a time to discover how they respond.

4. **How is economics used as a policy tool?**

   Individuals, businesses, and governments use economics as a policy tool. Individuals use the economic ideas of marginal benefit and marginal cost when making decisions for such topics as attending university, paying cash or credit for a purchase, and working. Businesses also

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use the concepts of marginal benefit and marginal cost when making decisions about what to produce, how to produce, and how many hours to stay open. Governments use marginal benefit and marginal cost when deciding issues such as the level of property taxes, the amount to fund higher education, or the level of a tariff on EU imports.

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1. What types of jobs do economists do?

Economists do jobs that require the collection and analysis of data on the production and use of resources. They work at jobs that require the ability to predict future trends. Economists are also in jobs that study to determine ways of using resources more efficiently.

Three common jobs that hire economists are market research analyst, financial analyst, and budget analyst.

A market research analyst works with data on buying patterns to forecast the likely success of a product and the price consumers are willing to pay for it.

A financial analyst studies trends and fluctuations in interest rates and stock and bond prices and tries to predict the cost of borrowing and the returns on investments.

A budget analyst keeps track of an organization's cash flow and prepares budget plans that incorporate predictions of future cash flows.

2. What is the range and median level of economists' pay?

The Web resource payscale.com reports a pay range for economists of all types from $60,675 to $127,500, with a median of $91,210.

3. What are the skills needed for an economics job?

The five most important skill requirements for an economics job are critical-thinking skills, analytical skills, math skills, writing skills, and oral communication skills.

Critical-thinking skills are the ability to clarify and solve problems using logic and relevant evidence.

Analytical skills are the use of economic ideas and tools to examine data, notice patterns, and reach a logical conclusion.

Math skills are the ability to use mathematical and statistical tools to analyze data and reach valid conclusions.

Writing skills are the ability to present ideas, conclusions, and reasons in succinct written reports appropriate for the target audience.

Oral communication skills are the ability to explain ideas, conclusions, and reasons to people with a limited background in economics.

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Answers to the Study Plan Problems and Applications

1. Apple Inc. decides to make iTunes freely available in unlimited quantities.

a. Does Apple's decision change the incentives that people face?

Apple's decision changes people's incentives. For example, it increases the incentive to buy an iPhone to take advantage of the newly "free" music available on iTunes.

b. Is Apple's decision an example of a microeconomic or a macroeconomic issue?

Apple's decision is a microeconomic issue because it affects a single company and a single market.

2. Which of the following pairs does not match?

a. Labour and wages

Labour earns wages, so this pair matches.

b. Land and rent

Land earns rent, so this pair matches.

c. Entrepreneurship and profit

Entrepreneurship earns profit, so this pair matches.

d. Capital and profit

Capital earns interest, so this pair does *not* match.

3. Explain how the following news headlines concern self-interest and the social interest.

a. Walmart Builds 500 New Stores in China

Walmart's expansion is a decision made by Walmart to further Walmart's interest. The decision is directly in Walmart's self-interest because Walmart's total revenue will increase. The social interest is affected because it gives the Chinese consumers more shopping options.

b. Amazon Will Deliver Groceries For Free

Amazon's decision to deliver groceries for free is a decision made by Amazon to further Amazon's interest. The decision is directly in Amazon's self-interest because more people will order from Amazon than from other online firms who do not offer free delivery. The social interest is affected because people will spend less time waiting in lines at grocery stores.

c. Food Must Be Labelled with Nutrition Data

The decision to require that food be labelled with nutrition information is made in the social interest. This decision is not made by any one single firm and so does not (necessarily) reflect anyone's self-interest.

4. The night before an economics test, you decide to go to the movies instead of staying home and working your MyLab Study Plan. Your grade on the test was 50 percent, lower than your usual 70 percent.

a. Did you face a tradeoff?

Yes, you faced a tradeoff. The tradeoff was between a higher test score and an evening with your friends at the movies.

b. What was the opportunity cost of your evening at the movies?

The opportunity cost of going to the movies is the fall in your grade. That is the 20 points forgone from choosing to see the movie rather than study.

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5. Olympics Could Cost More Than $26 Billion

Japanese media estimate that overall spending on Japan's new venues, including an expensive national stadium and athletes' village, is between $26 billion and $28 billion.

Source: *Los Angeles Times*, December 20, 2019

What is the opportunity cost of hosting the 2020 Olympics? Explain your answer.

The opportunity cost of something is the highest-valued alternative that we give up to get it. Japan spent $28 billion to host the Olympics in Tokyo. The opportunity cost of hosting the 2020 Olympics is not $28 billion, but the goods and services that would have been purchased with $28 billion if the money had not been spent on hosting the 2020 Olympics.

6. Which of the following statements is positive, which is normative, and which can be tested?

a. Canada should cut its imports.

The statement is normative and cannot be tested.

b. China is Canada's largest trading partner.

The statement is positive and can be tested.

c. If the price of gasoline rises, people will drive less and use less gasoline.

The statement is positive and can be tested.

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Answers to Additional Problems and Applications

7. **Swifties, Rejoice! Taylor Swift Will Perform a Free JamFest Concert in Atlanta**

Calm down, Swifties! Taylor Swift will headline a free concert at the Capital One JamFest, April 5!

Source: *USA Today*, November 8, 2019

When Taylor Swift performs at JamFest, what is free and what is scarce? Explain your answer.

The seats in the concert venue are scarce—there are only a limited number available. Also scarce is the time the enthusiastic fans spend at the concert. If the fans who obtain passes attend the concert rather than sell their "free" passes, they incur the opportunity cost of the forgone pass price. So the concert is *not* "free" for the concert-goers. The publicity that Taylor Swift receives is free to her but the publicity used reporters' scarce time to report on the event rather than reporting on other news worthy events.

8. **How does the creation of a successful movie influence *what*, *how*, and *for whom* goods and services are produced?**

The "what" question is influenced in two ways. First, one good or service that is produced is the successful movie. Second, spinoffs or similar films likely will be created in the future. The "how" question is influenced because movies use different production methods. Some movies, for example, have a lot of special effects while other movies have few or none. The "for whom" question is influenced because those people who, as the result of the blockbuster movie, have higher incomes have more goods and services produced for them.

9. **How does a successful movie illustrate self-interested choices that are also in the social interest?**

A successful movie increases the income of the people involved with the movie production. The choices of these people are driven largely by self-interest. The creation of a successful movie also increases the quantity of widely enjoyed entertainment. The amount of entertainment available in the economy increases, which benefits society. So the choices the people made in their self-interest are also in the social interest.

10. **Before starring in *Guardians of the Galaxy*, Chris Pratt had appeared in 11 movies that grossed an average of $7 million on the opening weekend. *Guardians of the Galaxy* grossed $94 million.**

a. **How will the success of *Guardians of the Galaxy* influence the opportunity cost of hiring Chris Pratt?**

The opportunity cost of something is the highest-valued alternative that must be given up to get it.

Based on the success of *Guardians of the Galaxy*, Chris Pratt will now require a higher salary to star in a movie. The extra money that is paid to Chris Pratt could have been used to hire other actors or to film more on location. The best alternative that is forgone because Chris Pratt is paid more money is the opportunity cost of hiring him.

b. **How have the incentives for a movie producer to hire Chris Pratt changed?**

Because Chris Pratt is now a proven actor who can draw in large first-weekend box office revenues, movie producers have a greater incentive to hire him. Since *Guardians of the Galaxy* was a hit, it is probable that Chris Pratt's future films will also be hits.

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11. What might be an incentive for you to take a class in summer school? List some of the benefits and costs involved in your decision. Would your choice be rational?

Early graduation, smaller class sizes, and retaining eligibility for a scholarship are examples of incentives that encourage taking summer classes. The benefits of taking summer classes might include more personal attention from the instructor and increased knowledge about some aspect of the world. Costs include forgone summer jobs or internships, less time to spend with friends, and additional tuition and other class-related expenses. The choice is rational if the student achieves the greatest benefit over cost.

12. Look at today's *National Post.* What is the leading economic news story? With which of the big economic questions does it deal and what tradeoffs does it discuss or imply?

On March 19, 2020, a top economic news story discussed was "Bacardi Helps Produce Hand Sanitizer With Change in Production". This news stories answers the following questions:
What goods and services are produced? The news story deals with the production of hand sanitizer by Bacardi.
How are goods and services produced? The news story describes how 1.7 million bottles of 10-ounce hand sanitizer will be produced using raw materials provided by Bacardi.
A tradeoff is giving up one thing to get something else. When Bacardi uses alcohol to produce hand sanitizer, it produces less rum.

13. Provide two microeconomic statements and two macroeconomic statements. Classify your statements as positive or normative. Explain why.

Microeconomic statements are: Fewer deep water oil wells should be drilled off the B.C. coast. If less oil is produced, the price of oil will rise. The first statement is normative because it relies on what the person thinks "should" be done. The second statement is positive because it is possible to test the effect of less oil being produced.
Macroeconomic statements are: The current unemployment rate is too high. The current unemployment rate is higher for men than for women. The first statement is normative because it depends on what is deemed "too high." The second statement is positive because it can be checked to determine its validity.

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Answers to the Appendix Review Quiz

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1. Explain how we "read" the graphs in Figs. A1.1 and A1.2.

The points in the graphs relate the quantity of the variable measured on the one axis to the quantity of the variable measured on the other axis. The quantity of the variable measured on the horizontal axis (the *x*-axis) is measured by the horizontal distance from the *y*-axis to the point. The quantity of the variable measured on the vertical axis (the *y*-axis) is measured by the vertical distance from the *x*-axis to the point. The point relates these two quantities. For example, in Figure A1.2a, point *A* shows that at a price of $9.11 a ticket, 1.2 billion movie tickets are sold.

2. Explain what scatter diagrams show and why we use them.

A scatter diagram is a graph that plots the value of one variable against the value of another variable for a number of different values of each variable. We use scatter diagrams because they quickly reveal if a relationship exists between the two variables.

3. Explain how we "read" the three scatter diagrams in Figs. A1.3 and A1.4.

The scatter diagram in Figure A1.3 shows the relationship between production budgets and worldwide box office revenues for ten popular movies. The figure shows no tendency for a larger production budget to bring a greater box office revenue.

The scatter diagram in Figure A1.4a shows the relationship between income measured in thousands of dollars per year, and expenditure measured in thousands of dollars per year, for the years 2008 to 2018. The scatter diagram shows that higher income leads to higher expenditure. The figure also shows this is a close relationship.

The scatter diagram in Figure A1.4b shows the relationship between the unemployment rate and the inflation rate for the years 2009 to 2019. The figure shows that for most of the years, the relationship between inflation and unemployment is weak.

4. Draw a graph to show the relationship between two variables that move in the same direction.

A graph that shows the relationship between two variables that move in the same direction is shown by a line that slopes upward.

5. Draw a graph to show the relationship between two variables that move in opposite directions.

A graph that shows the relationship between two variables that move in opposite directions is shown by a line that slopes downward.

6. Draw a graph of two variables whose relationship shows (a) a maximum and (b) a minimum.

A graph that shows the relationship between two variables that have a maximum is shown by a curve that starts out sloping upward, reaches a maximum, and then slopes downward.
A graph that shows the relationship between two variables that have a minimum is shown by a curve that starts out sloping downward, reaches a minimum, and then slopes upward.

7. Which of the relationships in Questions 4 and 5 is a positive relationship and which is a negative relationship?

The relationship in Question 4 between the two variables that move in the same direction is a positive relationship. The relationship in Question 5 between the two variables that move in opposite directions is a negative relationship.

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8. What are the two ways of calculating the slope of a curved line?

To calculate the slope of a curved line we can calculate the slope at a point or across an arc. The slope of a curved line at a point on the line is defined as the slope of the straight line tangent to the curved line at that point. The slope of a curved line across an arc—between two points on the curved line—equals the slope of the straight line between the two points.

9. How do we graph a relationship among more than two variables?

To graph a relationship among more than two variables, hold constant the values of all the variables except two. Then plot the value of one of the variables against the other variable.

10. Explain what change will bring a *movement along* a curve.

A movement along a curve occurs when the value of a variable measured on one of the axes changes while all of the other relevant variables not graphed on the axes do not change.

11. Explain what change will bring a *shift* of a curve.

A curve shifts when there is a change in the value of a relevant variable that is not graphed on the axes.

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Answers to the Appendix Study Plan Problems and Applications

Use the spreadsheet to work Problems 1 to 3. The spreadsheet provides the economic data: Column A is the year, column B is the inflation rate, column C is the interest rate, column D is the growth rate, and column E is the unemployment rate.

	A	B	C	D	E
1	2009	0.3	0.7	-2.9	8.3
2	2010	1.8	0.9	3.1	8.0
3	2011	2.9	1.3	3.1	7.4
4	2012	1.5	1.3	1.8	7.3
5	2013	0.9	1.3	2.3	7.1
6	2014	1.4	1.3	2.9	6.9
7	2015	1.6	0.9	0.7	6.9
8	2016	1.5	0.8	1.0	7.0
9	2017	1.8	1.0	3.2	5.8
10	2018	2.0	1.7	2.0	5.7
11	2019	2.1	2.0	1.6	5.6

1. **Draw a scatter diagram of the inflation rate and the interest rate. Describe the relationship.**

   To make a scatter diagram of the inflation rate and the interest rate, plot the interest rate on the *x*-axis and the inflation rate on the *y*-axis. The graph will be a set of dots. The pattern made by the dots shows a weak positive relationship.

2. **Draw a scatter diagram of the growth rate and the unemployment rate. Describe the relationship.**

   To make a scatter diagram of the growth rate and the unemployment rate, plot the growth rate on the *x*-axis and the unemployment rate on the *y*-axis. The graph will be a set of dots. The pattern made by the dots shows that when the growth rate increases, the unemployment rate usually decreases so there is a negative relationship.

3. **Draw a scatter diagram of the interest rate and the unemployment rate. Describe the relationship.**

   To make a scatter diagram of the interest rate and the unemployment rate, plot the interest rate on the *x*-axis and the unemployment rate on the *y*-axis. The graph will be a set of dots. The pattern made by the dots tells us that when the interest rate increases, the unemployment rate usually decreases so there is a negative relationship.

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Use the following news clip to work Problems 4 to 6.

***Star Wars* Tops the Box Office**

Movie	Theatres (number)	Revenue (dollars per theatre)
Star Wars: Episode IX-The Rise of Skywalker	4,406	$7,835
Jumanji: The Next Level	4,134	$6,344
Little Women	3,308	$4,114
Frozen II	3,175	$3,733

Source:
boxofficemojo.com

Data for weekend of January 3-5, 2020

4. Draw a graph of the relationship between the revenue per theatre on the *y*-axis and the number of theatres on the *x*-axis. Describe the relationship.

The graph shows a positive relationship.

5. Calculate the slope of the relationship in Problem 4 between 3,308 and 4,134 theatres.

The slope equals the change in revenue per theatre divided by the change in the number of theatres. The slope equals ($6,344 – $4,114)/(4,134 – 3,308), which equals $2.70 per theatre.

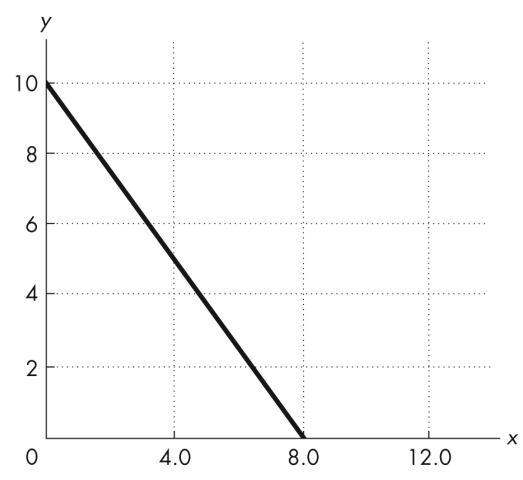
6. Calculate the slope of the relationship in Problem 4 between 3,175 and 4,406 theatres.

The slope equals the change in revenue per theatre divided by the change in the number of theatres. The slope equals ($7,835 – $3,733)/(4,406 – 3,175), which equals $3.33 per theatre.

7. Calculate the slope of the relationship shown in Figure A1.1.

The slope is –5/4. The curve is a straight line, so its slope is the same at all points on the curve. Slope equals the change in the variable measured on the *y*-axis divided by the change in the variable measured on the *x*-axis. To calculate the slope, select two points on the line. One point is at 10 on the *y*-axis and 0 on the *x*-axis, and another is at 8 on the *x*-axis and 0 on the *y*-axis. The change in *y* from 10 to 0 is associated with the change in *x* from 0 to 8. The slope of the curve equals –10/8, which equals –5/4.

FIGURE **A1.1**
Problem 7



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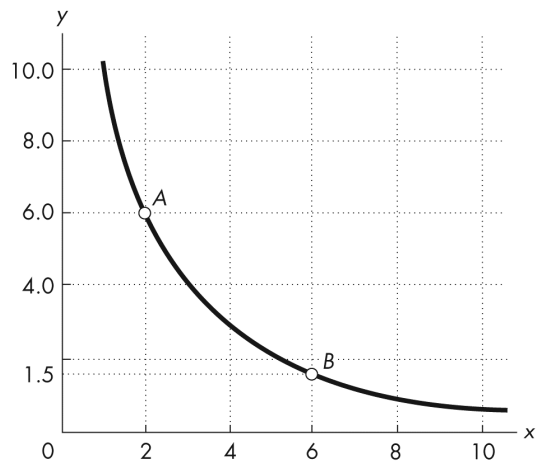
Use the relationship shown in Figure A1.2 to work Problems 8 and 9.

FIGURE **A1.2**
Problems 8 and 9



8. Calculate the slope of the relationship at point *A* and at point *B*.

The slope at point *A* is –2, and the slope at point *B* is –0.25. To calculate the slope at a point on a curved line, draw the tangent to the curved line at the point. Then find a second point on the tangent and calculate the slope of the tangent.

The tangent at point *A* cuts the *y*-axis at 10. The slope of the tangent equals the change in *y* divided by the change in *x*. The change in *y* equals –4 (6 minus 10) and the change in *x* equals 2 (2 minus 0). The slope at point *A* is –4/2, which equals –2.

The tangent at point *B* goes through the point (4,2). The change in *y* equals –0.5, and the change in *x* equals 2. The slope at point *B* is –0.25.

9. Calculate the slope across the arc *AB*.

The slope across the arc *AB* is –1.125. The slope across the arc *AB* equals the change in *y*, which is 4.5 (6.0 minus 1.5) divided by the change in *x*, which equals –4 (2 minus 6). The slope across the arc *AB* equals 4.5/–4, which is –1.125.

Use the table to work Problems 10 and 11. The table gives the price of a balloon ride, the temperature, and the number of rides a day.

Price (dollars per ride)	Balloon rides (number per day)		
	10°C	20° C	30° C
5	32	40	50
10	27	32	40
15	18	27	32

10. Draw a graph to show the relationship between the price and the number of rides, when temperature is 20°C. Describe this relationship.

The graph plots the price on the y-axis and the number of rides on the *x*-axis using the number of balloon rides in the column of the table labelled 20°C. The relationship between the price and the number of rides is negative. As the price rises, the number of rides decreases.

11. What happens in the graph in Problem 10 if the temperature rises to 30°C?

If the temperature rises to 30°C, the curve shifts rightward. At every price, more balloon rides are taken when the temperature is 30°C rather than 20°C.

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Answers to Appendix Additional Problems and Applications

Use the spreadsheet to work Problems 12 to 14. The spreadsheet provides data on oil and gasoline: Column A is the year, column B is the price of oil (dollars per barrel), column C is the price of gasoline (cents per litre), column D is oil production, and column E is the quantity of gasoline refined (both in millions of barrels per day).

	A	B	C	D	E
1	2009	66	92	5.4	14.8
2	2010	79	102	5.5	15.2
3	2011	95	124	5.6	15.1
4	2012	94	127	6.5	15.5
5	2013	98	128	7.5	15.2
6	2014	93	128	8.8	15.5
7	2015	51	106	9.4	16.6
8	2016	43	101	8.9	16.4
9	2017	53	113	9.8	16.9
10	2018	68	127	9.9	17.7
11	2019	62	117	9.9	17.4

12. Draw a scatter diagram of the price of oil and the quantity of oil produced. Describe the relationship.

The scatter diagram between the price of oil and the quantity of oil produced shows no relationship.

13. Draw a scatter diagram of the price of gasoline and the quantity of gasoline refined. Describe the relationship.

The scatter diagram between the price of gasoline and the quantity of gasoline refined shows a weak positive relationship.

14. Draw a scatter diagram of the quantity of oil produced and the quantity of gasoline refined. Describe the relationship.

The scatter diagram between the quantity of oil produced and the quantity of gasoline refined shows a positive relationship.

Use the following data to work Problems 15 to 17.

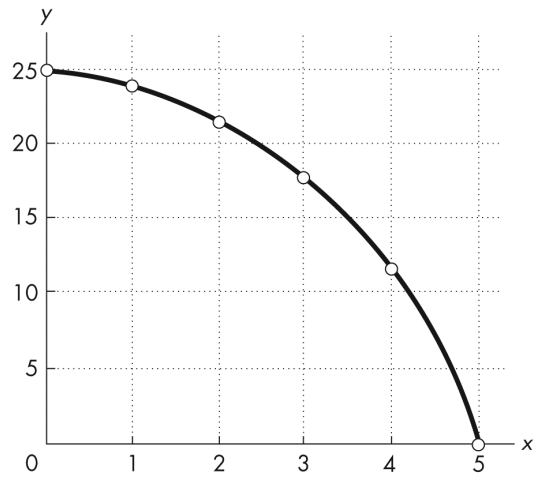
x	0	1	2	3	4	5
y	25	24	22	18	12	0

Draw a graph that shows the relationship between the two variables *x* and *y*.

To make a graph that shows the relationship between *x* and *y*, plot the *x*-variable on the *x*-axis and the *y*-variable on the *y*-axis. The graph is shown in Figure A1.3.

FIGURE **A1.3**

Problems 15, 16, and 17



15. a. Is the relationship positive or negative?

The relationship is negative because *x* and *y* move in opposite directions: As *x* increases, *y* decreases.

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b. Does the slope of the relationship become steeper or flatter as the value of *x* increases?

The slope becomes steeper as *x* increases.

c. Think of some economic relationships that might be similar to this one.

The less expensive a good, the greater is the number of people who buy it. The higher the interest rate, the smaller is the number of people who take out home mortgages. The less expensive gasoline, the greater the miles car owners drive.

16. Calculate the slope of the relationship between *x* and *y* when *x* equals 3.

The slope equals –4. The slope of the curve at the point where *x* is 3 is equal to the slope of the tangent to the curve at that point. Draw the tangent line at the point in Figure A1.3 where *x* is 3 and *y* is 18. Now calculate the slope of this tangent line by finding another point on the tangent. When *x* equals 5, *y* equals 10 on the tangent, so another point is *x* equals 5 and *y* equals 10. The slope equals the change in *y*, –8, divided by the change in *x*, 2, so the slope is –4.

17. Calculate the slope of the relationship across the arc as *x* increases from 4 to 5.

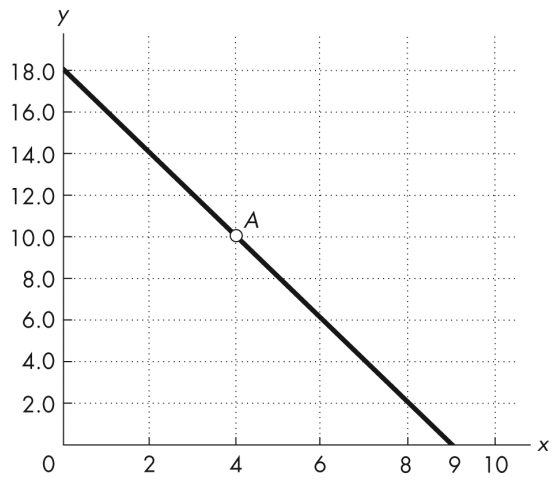
The slope is –12. The slope of the relationship across the arc when *x* increases from 4 to 5 is equal to the slope of the straight line joining the points on the curve at *x* equals 4 and *x* equals 5. When *x* increases from 4 to 5, *y* falls from 12 to 0. The slope equals the change in *y*, –12 (0 minus 12), divided by the change in *x*, 1 (5 minus 4), so the slope across the arc is –12.

18. Calculate the slope of the curve in Figure A1.4 at point *A*.

The slope is –2. The curve is a straight line, so its slope is the same at all points on the curve. Slope equals the change in the variable measured on the *y*-axis divided by the change in the variable measured on the *x*-axis. To calculate the slope, select two points on the line. One point is at 18 on the *y*-axis and 0 on the *x*-axis, and another is at 9 on the *x*-axis and 0 on the *y*-axis. The change in *y* from 18 to 0 is associated with the change in *x* from 0 to 9. Therefore the slope of the curve is –18/9, which equals –2.

FIGURE **A1.4**

Problem 18



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Use Figure A1.5 to work Problems 19 and 20.

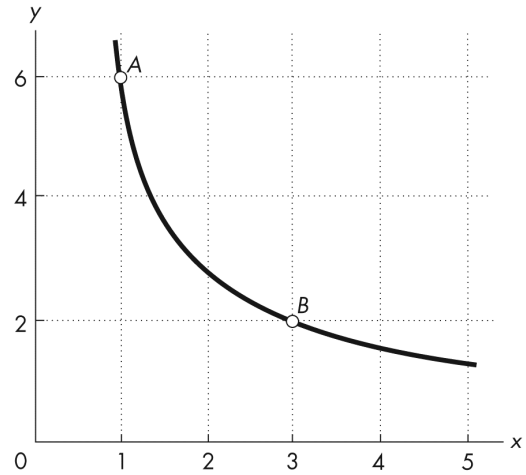
19. Calculate the slope at point *A* and at point *B*.

The slope at point *A* is –4, and the slope at point *B* is –1. To calculate the slope at a point on a curved line, draw the tangent to the line at the point. Then find a second point on the tangent and calculate the slope of the tangent.

The tangent at point *A* cuts the *x*-axis at 2.5. The slope of the tangent equals the change in *y* divided by the change in *x*. The change in *y* equals 6 (6 minus 0) and the change in *x* equals –1.5 (1 minus 2.5). The slope at point *A* is 6/–1.5, which equals –4. Similarly, the slope at point *B* is –1. The tangent at point *B* cuts the *y*-axis at 5. The change in *y* equals 3, and the change in *x* equals –3.

FIGURE **A1.5**

Problems 19 and 20



20. Calculate the slope across the arc *AB*.

The slope across the arc *AB* is –2. The slope across the arc *AB* equals the change in *y*, which is 4 (6 minus 2) divided by the change in *x*, which equals –2 (1 minus 3). The slope across the arc *AB* is 4/–2, which equals –2.

Use the following table to work Problems 21 to 23.

The table gives information about umbrellas: price, the number purchased, and rainfall in millimeters (mms).

Price (dollars per umbrella)	Umbrellas (number purchased per day)		
	0 mm	200 mm	400 mm
20	4	7	8
30	2	4	7
40	1	2	4

21. Draw a graph to show the relationship between the price and the number of umbrellas purchased, holding the amount of rainfall constant at 200 mm. Describe this relationship.

To draw a graph of the relationship between the price and the number of umbrellas when the rainfall equals 200 mm, keep the rainfall at 200 mm and plot the data in that column against the price. The relationship between the price and the number of umbrellas is a negative relationship.

22. What happens in the graph in Problem 21 if the price rises and rainfall is constant?

If the price rises, the number of umbrellas decreases. There is a movement upward along the (unchanged) curve.

23. What happens in the graph in Problem 21 if the rainfall increases from 200 mm to 400 mm?

The curve when the rainfall is 400 mm lies to the right of the curve when the rainfall is 200 mm showing that at every price, more umbrellas are purchased when the rainfall is 400 mm than when the rainfall is 200 mm.

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Chapter 2

THE ECONOMIC PROBLEM

Answers to the Review Quizzes

Page 36

1. How does the production possibilities frontier illustrate scarcity?

The unattainable combinations of production that lie *beyond* the *PPF* illustrate the concept of *scarcity*. There are not enough resources to produce any of these combinations. And 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 production points that lie on the *PPF* illustrate the concept of production efficiency. These points are attained only by producing the goods and services at the lowest possible cost. At any point inside the frontier, we are giving up more than necessary of one good to produce a given quantity of the other good. Such points cannot be production efficient.

3. How does the production possibilities frontier show that every choice involves a tradeoff?

Movements along the *PPF* illustrate that producing more of one good requires producing less of the other good. This observation reflects the result that a *tradeoff* must be made when producing efficiently.

4. How does the production possibilities frontier illustrate opportunity cost?

The negative slope of the production possibilities frontier illustrates the concept of *opportunity cost*. Moving along the production possibilities frontier, producing additional units of a good requires that the output of the other good must fall. This tradeoff 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 to the increase in the production of the good on the *x*-axis moving downward along the *PPF*. The steeper the slope, the greater is the ratio, and the greater is the opportunity cost of increasing producing of the good measured on the horizontal axis.

6. Why does the *PPF* bow outward and what does that imply about the relationship between opportunity cost and the quantity produced?

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 smartphones. If society allocates resources wisely, it will use each resource to produce the kind of output for which it is best suited. Consider a *PPF* with pizza measured on the *x*-axis and smartphones measured on the *y*-axis. A small increase in pizza output when pizza production is relatively *low* requires only a small increase in the use of those resources still good at making pizza and not good at making smartphones. This yields a small decrease in smartphone production for a large increase in pizza production, creating a relatively *low opportunity cost* reflected in the gentle slope of the *PPF* over this range of output. However, the same small increase in pizza output

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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 to making smartphones. This reallocation of resources yields a relatively small increase in pizza output for a large decrease in smartphone output, creating a relatively *high opportunity cost* reflected in the steep slope of the *PPF* over this range of output. The opportunity cost of producing pizza increases with the quantity of pizza produced as the slope of the *PPF* becomes ever steeper. This effect creates the *bowed-out* shape, which shows that as more of a good is produced, the opportunity cost of producing additional units increases.

Page 39

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. The magnitude of the slope of the *PPF* is the marginal cost of a unit of the good measured on the *x*-axis. As the magnitude of the slope changes moving along the *PPF*, the marginal cost changes.

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

The *marginal benefit of* a good or service is the benefit received from consuming one more unit of it. It is measured by what an individual is willing to give up (or pay) for an additional unit.

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

As more of a good is consumed, the marginal benefit of each unit is smaller than the marginal benefit of the unit consumed immediately before it, and is larger than the marginal benefit of the unit consumed immediately after it. This set of results is known as the *principle of decreasing marginal benefit*.

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

Allocative efficiency is a situation in which goods and services are produced at the lowest possible cost and in the quantities that provide the greatest possible benefit. We cannot produce more of any good without giving up some of another good that we value more highly. The allocative efficient level of output is the point on the *PPF* for which marginal benefit equals 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 another good or service that is *valued more highly*. This is known as *allocative efficiency*, which occurs when production efficiency is achieved, and the marginal benefit of the last unit produced is equal to the marginal cost of producing the last unit.

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1. What gives a person a comparative advantage?

A person has a comparative advantage in an activity if that person can perform the activity at a lower opportunity cost than anyone else. If the person gives up the least amount of other goods and services to produce a particular good or service, the person has the lowest opportunity cost of producing that good or service.

2. Distinguish between comparative advantage and absolute advantage.

A person has a *comparative advantage* in an activity if that person can perform the activity at a lower opportunity cost than anyone else. A person who is more productive than others has

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an *absolute advantage*. Absolute advantage involves comparing productivities—production per hour—and comparative advantage involves comparing opportunity costs.

3. **Why do people specialize and trade?**
   If people specialize and sell the good in which they have a comparative advantage and buy the good in which they do not have a comparative advantage, then they can consume at a point outside their *PPF*.
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 can consume a larger quantity of goods and services after trading with others who have also specialized, than would otherwise be possible. These increases are the gains from specialization and trade for society and for individuals.
5. **What is the source of the gains from trade?**
   When people have different opportunity costs of producing goods and services, total output is higher with specialization and trade than if specialization and trade did not occur. The increase in output that arises from divergent opportunity costs is the gains from trade.
6. **Why do specialization and the gains from trade make the economy's *PPF* bow outward?**
   Initially, a good is produced by the producers with the lowest opportunity costs of production. But as more and more of the good is produced, producers with higher opportunity costs of production begin to produce the good. The slope of the *PPF* increases as producers with higher opportunity costs begin production, giving the *PPF* a bowed-out shape.
7. **Why is not specializing and reaping the gains from trade inefficient?**
   Failure to specialize and trade means that producers are not producing the good in which they have a comparative advantage, and production occurs inside the *PPF*—a point of inefficiency. All the economy's resources are fully employed, but they are misallocated.

Page 47

1. **What generates economic growth?**
   The two key factors that generate economic growth are *technological change* and *capital accumulation*. Technological change is the development of new goods and of better ways of producing goods and services. Capital accumulation is the growth of capital resources, including human capital.
2. **How does economic growth influence the production possibilities frontier?**
   Economic growth shifts the *PPF* outward.
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 of economic growth.
4. **Explain why Hong Kong has experienced faster economic growth than Canada.**
   Hong Kong devotes a greater proportion of its available resources to the production of capital than Canada. Canada devotes one-fifth of its resources to accumulating capital. Hong Kong devotes one-third of its resources to accumulating capital. This allows Hong Kong to grow at a faster rate than Canada.

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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 because it will never be possible to satisfy all our wants. Economic growth allows more wants to be satisfied but it does not eliminate scarcity.

6. How does economic growth change the patterns of production?

In a low-income country, a large percentage of production is agriculture. As a country invests in capital and uses more advanced technologies, its production possibilities expand and it can more easily satisfy the want for food, so most of the increase in production is in manufacturing. With advances in technology used in manufacturing, industrial production increases, but the industrial labour force shrinks. The labour released from industrial jobs is the source of expanded production possibilities in services. So in a high-income country like Canada, technological advances release labour from industrial production and move the labour into service production.

7. Why does economic growth destroy and create jobs?

As a country experiences economic growth, investment in capital and advances in technology increase industrial production but the industrial labour force shrinks. Labour is released from industrial jobs and increases production possibilities in services. Many of the industrial workers lack the skills needed for the new service jobs so training in new skills is required. Most of the new jobs are in different places from those in which jobs are lost. Job training and relocating are costly and slow activities, so a large number of people avoid these costs and remain unemployed.

Page 49

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

These social institutions are necessary for a decentralized economy to coordinate production. *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 good or service. With firms people are able to specialize in producing particular parts of a good or service. Discovering trade opportunities is what allows a person to gain from his comparative advantage. 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. 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?

Real flows of goods and services and money flows of payments for factors of production (wages, rent, interest, and profits) flow from firms to households. Money flows of expenditures on goods and services and real flows of the factors of production (labour, land, capital, and entrepreneurship) flow from households to firms.

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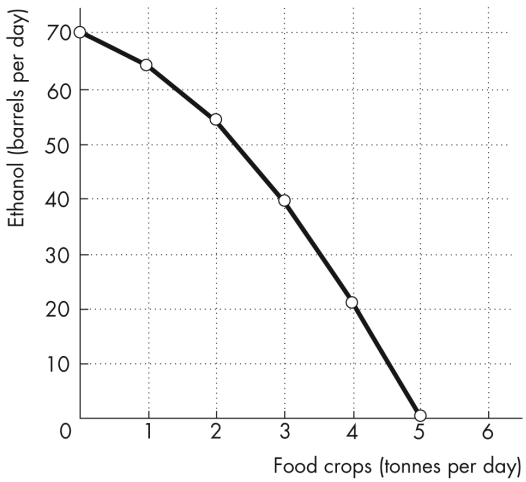
Answers to the Study Plan Problems and Applications

Use the following information to work Problems 1 to 3. Brazil produces ethanol from sugar, and the land used to grow sugar can be used to grow food crops. The table sets out Brazil's production possibilities for ethanol and food crops.

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

FIGURE **2.1**
Problem 1



1. 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 indicates scarcity because it shows the limits to what can be produced. Production combinations of ethanol and food crops that lie outside the production possibilities frontier are not attainable.

   b. **If Brazil produces 40 barrels of ethanol a day, how much food must it produce to achieve production efficiency?**
   If Brazil produces 40 barrels of ethanol per day, it achieves production efficiency if it also produces 3 tonnes 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. To increase production of one good requires decreasing production of the other—a tradeoff.

2. a. **If Brazil increases ethanol production from 40 barrels a day to 54 barrels a day, what is the opportunity cost of producing the additional ethanol?**
   When Brazil is production efficient and increases its production of ethanol from 40 barrels a day to 54 barrels a day, it must decrease its production of food crops from 3 tonnes a day to 2 tonnes a day. The opportunity cost of producing the additional ethanol is 1 tonne of food a day for the entire 14 barrels of ethanol or 1/14 of a tonne of food per barrel of ethanol.

   b. **If Brazil increases food production from 2 tonnes per day to 3 tonnes per day, what is the opportunity cost of producing the additional food?**
   When Brazil is production efficient and increases its production of food crops from 2 tonnes per day to 3 tonnes per day, it must decrease its production of ethanol from 54 barrels per day to 40 barrels per day. The opportunity cost of producing the additional 1 tonne of food crops is 14 barrels of ethanol.

   c. **What is the relationship between your answers to parts (a) and (b)?**
   The opportunity cost of producing an additional barrel of ethanol and the opportunity cost of producing an additional tonne of food crops are reciprocals of each other. That is, the opportunity cost of producing 1 tonne of food crops is 14 barrels of ethanol and the opportunity cost of producing 1 barrel of ethanol is 1/14 of a tonne of food crops.

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3. Does Brazil face an increasing opportunity cost of producing ethanol? What feature of Brazil's *PPF* illustrates increasing opportunity cost?

Brazil faces an increasing opportunity cost of producing ethanol. When increasing ethanol production from 0 barrels to 22 barrels per day, the opportunity cost of producing a barrel of ethanol is 1/22 of a tonne of food crops. And when increasing ethanol production from 22 barrels to 40 barrels per day, the opportunity cost of producing a barrel of ethanol is 1/18 of a tonne of food crops. The *PPF*'s bowed-out shape reflects increasing opportunity cost.

Use the above table (for Problems 1 to 3) to work Problems 4 and 5.

4. Define marginal cost and calculate Brazil's marginal cost of producing a tonne of food when the quantity produced is 2.5 tonnes 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 tonnes, the marginal cost of a tonne of food is the opportunity cost of increasing the production of food from 2 tonnes per day to 3 tonnes per day. The production of ethanol falls from 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 production, so the opportunity cost of producing a tonne of food when 2.5 tonnes of food per day are produced is 14 barrels of ethanol per day.

5. Define marginal benefit. Explain how it is measured and why the data in the table does not enable you to calculate Brazil's marginal benefit of food.

The marginal benefit of a good is the benefit received from consuming one more unit of the good. 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. The table has no information on the marginal benefit of food.

6. 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 possible cost. Production efficiency occurs at all points *on* the *PPF*. 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.

Use the following data to work Problems 7 and 8.

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

7. 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 jackets 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 jackets 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.

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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 jacket)/(15 caps), which is 0.067 jackets 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 jackets per cap, which is higher than her cost of producing a cap.

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.)

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 producing 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. 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. 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*.

Measure the quantity of pork produced on the *x*-axis and measure the quantity of wheat produced on the *y*-axis. *Because* the marginal cost of both wheat and pork increase as more of the good is produced, the *PPF* has a bowed-out shape.

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

The new technology rotates the *PPF* outward. If the farm puts all of its resources into pork production, it can produce more pork. But if the farm puts all of its resources into wheat production, it still produces the same quantity of wheat.

c. With the farm using the new technology in part (b), has the opportunity cost of producing a tonne of wheat changed? Explain and illustrate your answer.

With the new technology, the opportunity cost of producing pork decreases. To increase pork production, the production of wheat decreases by less than prior to the implementation of the new technology. The opportunity cost of producing wheat is the inverse of the opportunity cost of producing pork. So the opportunity cost of producing wheat increases.

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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.

10. For 50 years, Cuba has had a centrally planned economy in which the government makes the big decisions on how resources will be allocated.

a. Why would you expect Cuba's production possibilities (per person) to be smaller than those of Canada?

Cuba devotes a large percentage of its resources to producing consumption goods because it does not actively trade and obtain these consumption goods from countries that have a comparative advantage in their production. So Cuba cannot produce many capital goods. Canada trades for goods in which it does not have a comparative advantage, and does not have to produce goods in which it does not have a comparative advantage. Canada can produce many capital goods.

The more of its resources that a country devotes to producing consumption goods and the fewer resources to producing capital and developing technologies, the smaller its production possibilities.

b. What are the social institutions that Cuba might lack that help Canada to achieve allocative efficiency?

Of the four social institutions, firms, money, markets, and property rights, Cuba's economy has firms and money. Markets in Cuba have more government intervention than in Canada, But the major difference is the property rights in the Cuban economy. In Cuba the government owns most of the firms. Because the firms are not motivated to make a profit, the managers of these firms have little incentive to operate the firm efficiently or to produce the goods and services that consumers desire. In Canada, property rights govern the ownership, use and disposal of anything that people value.

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Answers to Additional Problems and Applications

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

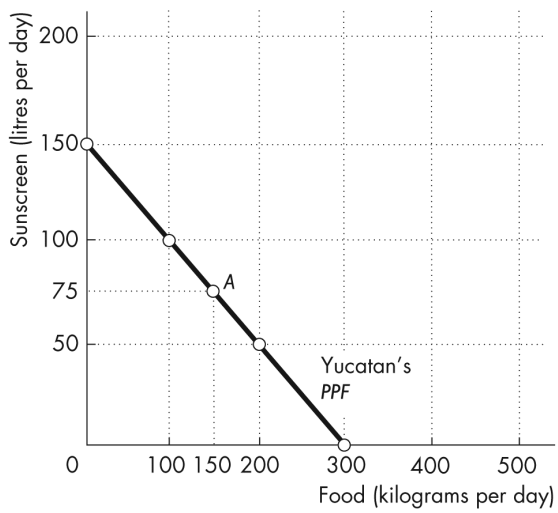
Food (kilograms per day)		Sunscreen (litres per day)
300	and	0
200	and	50
100	and	100
0	and	150

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

Yucatan's *PPF* is illustrated in Figure 2.2. 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.

FIGURE **2.2**

Problem 11



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

If Yucatan produces 150 kilograms of food per day, then the point labelled *A* on the *PPF* in Figure 2.2 shows that Yucatan must produce 75 litres of sunscreen per day to achieve production efficiency.

c. What is Yucatan's opportunity cost of producing (i) 1 kilogram of food and (ii) 1 litre of sunscreen?

Yucatan's *PPF* is linear so the opportunity cost of producing 1 kilogram of food is the same at all quantities. Calculate the opportunity cost of producing 1 kilogram of food when increasing the production of food from 0 to 100 kilograms per day. The quantity of sunscreen produced falls from 150 litres per day to 100 litres per day, a decrease of 50 litres. So the opportunity cost of producing a kilogram of food is (50 litres of sunscreen)/(100 kilograms of food), which is 0.5 litres of sunscreen.

Similarly, the opportunity cost of producing 1 litre of sunscreen is the same at all quantities. Calculate the opportunity cost of producing 1 litre of sunscreen when increasing the production of sunscreen from 0 to 50 litres per day. The quantity of food produced falls from 300 kilograms per day to 200 kilograms per day, a decrease of 100 kilograms. The opportunity cost of producing a litre of sunscreen is (100 kilograms of food)/(50 litres of sunscreen), which is 2.0 kilograms of food.

d. What is the relationship between your answers to part (c)?

The answer to part (c) reflects 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 cost increases as more of a good is produced, the *PPF* bows outward.

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Yucatan's *PPF* is linear and along a linear *PPF* the opportunity cost of producing a good is constant. Yucatan's opportunity cost of producing food equals 0.5 litres of sunscreen per kilogram of food at all quantities of food. Yucatan's resources are equally productive in both activities.

13. In problem 11, what is the marginal cost of 1 kilogram of food in Yucatan when the quantity produced is 150 kilograms per day? What is special about the marginal cost of food in Yucatan?

The marginal cost of a kilogram of food in Yucatan is constant at all points along Yucatan's *PPF* and is equal to 0.5 litres of sunscreen per kilogram of food. Yucatan's marginal cost is special because it is constant. This result reflects Yucatan's linear *PPF*.

14. The table describes the preferences in Yucatan.

Sunscreen (litres per day)	Willingness to pay (kilograms of food per litre)
25	3
75	2
125	1

a. What is the marginal benefit of sunscreen and how is it measured?

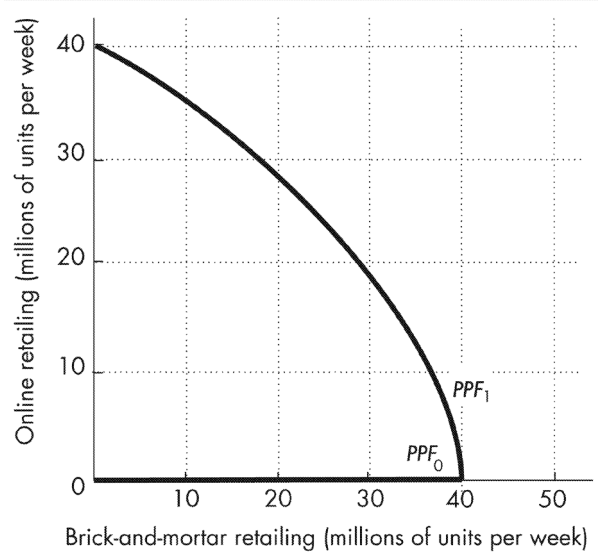
The marginal benefit of sunscreen is the benefit enjoyed by the person who consumes one more litre of sunscreen. It is equal to the willingness to pay for an additional litre.

b. What does Yucatan produce to achieve allocative efficiency?

When allocative efficiency is achieved, Yucatan is producing at the point on the *PPF* that is most preferred. At this point, the marginal benefit of sunscreen equals the marginal cost of sunscreen. The marginal cost of sunscreen is 2 kilograms of food per litre. The table shows that the marginal benefit of sunscreen is 2 kilograms of food per litre when the quantity produced is 75 litres of sunscreen per month.

FIGURE **2.3**

Problem 15a



Hudson's Bay Closing Brick-and-Mortar Stores

As more people choose online shopping over brick-and-mortar stores, the Bay has been closing stores.

Source: *National Post*, September 13, 2019

15. a. Draw the *PPF* curves for brick-and-mortar retailers and online retailers before and after the Internet became available.

Before the introduction of the Internet, it is not possible to produce online retailing. In Figure 2.3, PPF_0 runs along the *x*-axis. After the Internet, there is a tradeoff between online retailing and brick-and-mortar retailing. PPF_1 intersects both axes, slopes downward, is bowed outward, and the same maximum quantity of brick-and-mortar retailing can be produced as before the Internet.

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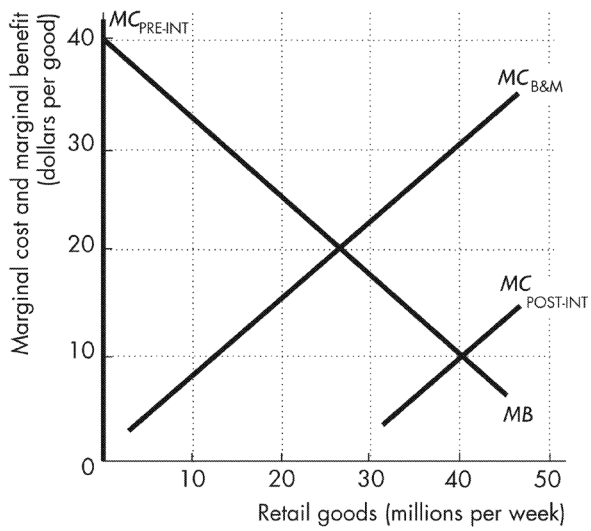
b. Draw the marginal cost and marginal benefit curves for brick-and-mortar retailers and online retailers before and after the Internet became available.

In Figure 2.4, the *MB* curve shows decreasing marginal benefit of retailing. The $MC_{B\&M}$ curve shows the increasing marginal cost of brick-and-mortar retailing. The $MC_{\text{Pre-Int}}$ curve along the *y*-axis shows that no matter how great the marginal cost, no online retailing can occur before the Internet. The $MC_{\text{Post-Int}}$ curve shows that the marginal cost of online retailing is lower than the marginal cost of brick-and-mortar retailing.

FIGURE **2.4**

Problem 15b



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

The expansion of production possibilities lowers the cost of retailing. The expansion of production possibilities does not influence preferences, which are buyers' likes and dislikes. With the lower cost of retailing, the quantity of retailing increases. But with online retailing less expensive than brick-and-mortar retailing, retailing in stores decreases.

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

Defeat Malaria in a Generation—Here's How

The world could be free of malaria within a generation, a major report says. Malaria eradication within a generation is ambitious, achievable, and necessary. The report estimates around $4.3bn is spent on malaria every year. But it would need a further $2bn a year to rid the world of malaria by 2050.

Source: *BBC News*, September 9, 2019

16. Is the report describing *production efficiency* or *allocative efficiency* or both?

We achieve production efficiency if we produce goods and services at the lowest possible cost. All points on the production possibilities frontier achieve production efficiency. And all points on the production possibilities frontier involve a tradeoff. The report is describing a point on the *PPF*. To eradicate malaria would require "a further $2bn a year". Some other good or service valued at $2 billion would have to be given up to eradicate malaria.

Allocative efficiency occurs when goods and services are produced at the lowest possible cost and in the quantities that provide the greatest possible benefit. Allocative efficiency occurs when marginal cost equals marginal benefit. The report is also describing allocative efficiency. The allocatively efficient quantity is the current quantity of malaria cases. To decrease malaria cases by 100 percent would mean a reduction that is greater than the allocatively efficient quantity. Marginal cost would exceed marginal benefit.

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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 curves to show the marginal cost and the marginal benefit of malaria eradication.

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

As the percentage of malaria cases that are eradicated increases, the marginal cost of each additional percentage increases. So the marginal cost curve is upward sloping. Marginal benefit of malaria eradication is the benefit received from eradicating one more percent of malaria cases. As the percentage of malaria cases that are eradicated increases, the marginal benefit of each additional percentage decreases. So the marginal benefit curve is downward sloping. The point of allocative efficiency is the point at which the marginal cost of malaria eradication equals the marginal benefit of malaria eradication.

Use the following data to work Problems 18 and 19.
Kim can produce 40 pies or 400 cakes an hour. Liam can produce 100 pies or 200 cakes an hour.

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

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

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

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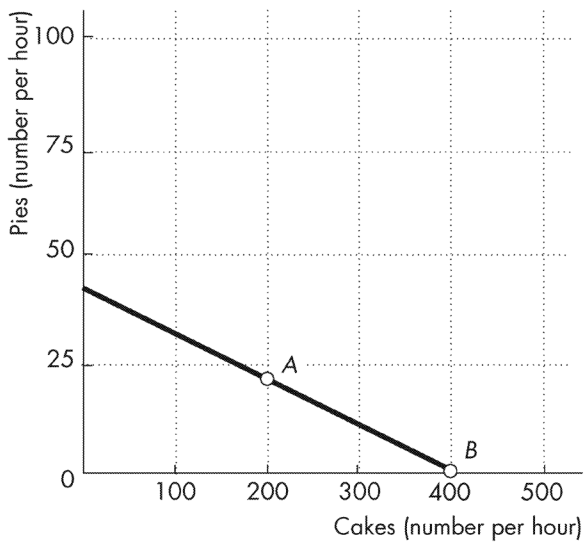
19. a. Draw a graph of Kim's *PPF* and Liam's *PPF* and show the point at which each produces when they spend 30 minutes of each hour producing pies and 30 minutes producing cakes.

Kim's *PPF* is illustrated in Figure 2.5; Liam's *PPF* is illustrated in Figure 2.6.
Point *A* in both figures shows their production points when each spends 30 minutes making cakes and 30 minutes making pies.

FIGURE **2.5**
Problem 19



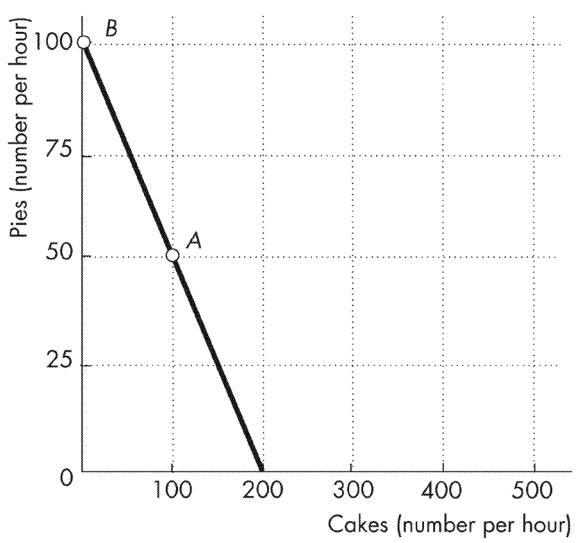
b. On your graph, show what Kim produces and what Liam produces when they specialize.

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.

FIGURE **2.6**
Problem 19



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).

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20. Tony and Patty produce skis and snowboards. The top table shows Tony's production possibilities and the bottom table shows Patty's production possibilities. Each week Tony produces 5 snowboards and 40 skis; Patty produces 10 snowboards and 5 skis.

a. Who has a comparative advantage in producing (i) snowboards and (ii) skis?

The person with a comparative advantage in producing snowboards is the person who has the lower opportunity cost of producing a snowboard. Tony's production possibilities show that to produce 5 more snowboards he must produce 10 fewer skis. So Tony's opportunity cost of producing a snowboard is 2 skis.

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

Patty's production possibilities show that to produce 10 more snowboards, she must produce 5 fewer skis. So Patty's opportunity cost of producing a snowboard is ½ of a ski. Patty has a comparative advantage in producing snowboards because her opportunity cost of producing a snowboard is less than Tony's opportunity cost of producing a snowboard.

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

Tony has a comparative advantage in producing skis. For each ski produced, Tony must give up making 1/2 a snowboard. For each ski that Patty produces, she must give up making 2 snowboards. So Tony's opportunity cost of a producing ski is lower than Patty's opportunity cost of producing a ski.

b. If Tony and Patty specialize and trade 1 snowboard for 1 ski, what are the gains from trade?

Patty has a comparative advantage in producing snowboards, so she specializes in snowboards. Tony has a comparative advantage in producing skis, so he specializes in producing skis. Patty produces 20 snowboards and Tony produces 50 skis.

Before specializing, they produced 15 snowboards (Patty's 10 plus Tony's 5) and 45 skis (Tony's 40 plus Patty's 5). By specializing, they increase their total output by 5 snowboards and 5 skis. They can share this gain by trading 1 ski for 1 snowboard. Patty can obtain skis from Tony for less than it costs her to produce them. Tony can obtain snowboards from Patty for less than it costs him to produce them. The gains from trade are the additional 5 snowboards and 5 skis.

21. Capital accumulation and technological change bring economic growth: Production that was unattainable yesterday becomes attainable today; production that is unattainable today will become attainable tomorrow. Why doesn't economic growth bring an end to scarcity?

People's wants are infinite—regardless of what a person already possesses, everyone can easily visualize something else he wants. Because people's wants are insatiable, scarcity will always exist regardless of economic growth.

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SpaceX will Send Three Tourists to the International Space Station Next Year
SpaceX will send three tourists on a 10-day trip to the International Space Station sometime in late 2021.

Source: *The Verge*, March 5, 2020

22. What is the opportunity cost of creating the technology for trips to the International Space Station?

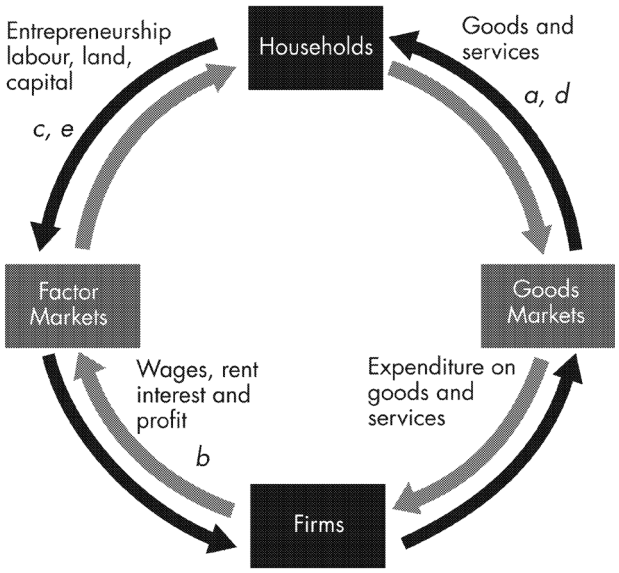
When SpaceX puts resources into creating technology for trips to the International Space Station in the future, SpaceX has fewer resources to produce other goods and services today. The decrease in the production of goods and services today is the opportunity cost of SpaceX creating the technology for trips to the International Space Station.

23. Sketch SpaceX's *PPF* for trips to the International Space Station and other goods and services and show its planned production in 2021.

Measure other goods and services on the *y*-axis and trips to the International Space Station on the *x*-axis. SpaceX's *PPF* is a downward-sloping curve that is bowed outward showing the tradeoff between other goods and services and trips to the International Space Station. In 2021, SpaceX produces 1 trip to the International Space Station, so the production point in 2021 is on its *PPF* at one trip.

24. On a graph of the circular flows in the market economy, the real and money flows in which the following items belong:

FIGURE **2.7**
Problem 24



a. You buy an iPad from the Apple Store.

Figure 2.7 shows the circular flows in a market economy. Your purchase of an iPad from Apple is the purchase of a good from a firm. This flow is the black arrow labelled *a* in the figure. When you pay for the iPad, the money flow is the grey arrow in the opposite direction to the black arrow labelled *a*.

b. Apple Inc. pays the designers of the iPad.

Apple's payment to the designers of the iPad is the payment of a wage to a factor of production. This flow is the grey arrow labelled *b* in the figure. The flow of design services from the designer to Apple is the black arrow in the opposite direction to the grey arrow labelled *b*.

c. Apple Inc. decides to expand and rents an adjacent building.

Apple's decision to expand by renting a building means that Apple is increasing the capital it uses. This flow is the black arrow labelled *c* in the figure. The flow of the payment for the rental services of the building is the grey arrow in the opposite direction to the black arrow labelled *c*.

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d. You buy a new e-book from Amazon.

Your purchase of an e-book from Amazon is the purchase of a good from a firm. This flow is the black arrow labelled *d* in the figure. When you pay for the e-book, the money flow is the grey arrow in the opposite direction to the black arrow labelled *d*.

e. Apple Inc. hires a student as an intern during the summer.

Apple's decision to hire a student intern is Apple increasing the labour it uses. The flow of labour services is the black arrow labelled *e* in the figure. The flow of the payment for the labour services is the grey arrow in the opposite direction to the black arrow labelled *e*.

Economics in the News

25. After you have studied *Economics in the News* on pp. 50–51, answer the following questions.

a. How does the deal between B.C. and the Fort Nelson First Nation change the Fort Nelson economy's *PPF* in 2021?

If we measure energy production on the *x*-axis of the Fort Nelson economy's *PPF* and other goods and services on the *y*-axis, then the opening of the LNG plant expands energy production possibilities and the Fort Nelson economy's *PPF* rotates outward. At every quantity of other goods and services produced, the Fort Nelson economy can produce more energy.

b. How would a technological advance in the production of geothermal energy production change the Fort Nelson economy's *PPF* in 2025?

A technological advance in geothermal energy production enables an increase in the production of energy and an increase in the production of other goods and services. So a technological advance in geothermal energy production shifts the Fort Nelson economy's *PPF* outward.

c. How will the new LNG plant change the opportunity cost of producing energy?

The LNG plant expands energy production possibilities and rotates the Fort Nelson economy's *PPF* outward. Fewer other goods and services must be given up to produce an additional unit of energy. The opportunity cost of producing energy decreases.

d. If a technological advance makes geothermal energy production possible, how might the opportunity cost of producing other goods and services (like strawberries) change?

The opportunity cost of producing other goods and services depends on how the technological advance changes production of energy and production of other goods and services. Compared to the outcome prior to the technological advance, if increasing production of other goods and services means a smaller quantity of energy production forgone, the opportunity cost of producing other goods and services decreases. If increasing production of other goods and services means a larger quantity of energy production forgone, the opportunity cost of producing other goods and services increases. If increasing production of other goods and services means no change in the quantity of energy production forgone, the opportunity cost of producing other goods and services does not change.

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26. Disney Hopes Wall Street Bets on New Global Streaming Service

Walt Disney Co. unveiled details of a family-friendly streaming service on Thursday with TV shows and movies from some of the world's most popular entertainment franchises. Disney says its new streaming service, Disney Plus, will cost $6.99 US per month.

Source: Reuters, April 11, 2019

a. How has live streaming changed the production possibilities of video entertainment and other goods and services?

With live streaming, more video entertainment can be produced when all resources are used to produce video entertainment. But the quantity of other goods and services does not change when all resources are used to produce the other goods and services.

b. Sketch a *PPF* for video entertainment and other goods and services before live streaming.

In Figure 2.8, PPF_0 measures video entertainment on the *x*-axis and other goods and services on the *y*-axis before live streaming. The *PPF* is bowed outward.

c. Show how the arrival of inexpensive live streaming has changed the *PPF*.

With live streaming, more video entertainment can be produced when all resources are used to produce video entertainment. But the quantity of other goods and services does not change when all resources are used to produce the other goods and services. In Figure 2.8, with live streaming, the production possibilities frontier rotates outward from PPF_0 to PPF_1. The *y*-axis intercept does not change and the *x*-axis intercept increases.

d. Sketch a marginal benefit curve and marginal cost curve for video entertainment before and after live streaming.

Figure 2.9 shows the curves. The marginal benefit curve is a downward-sloping curve. The

FIGURE **2.8**

Problem 26b and 26c

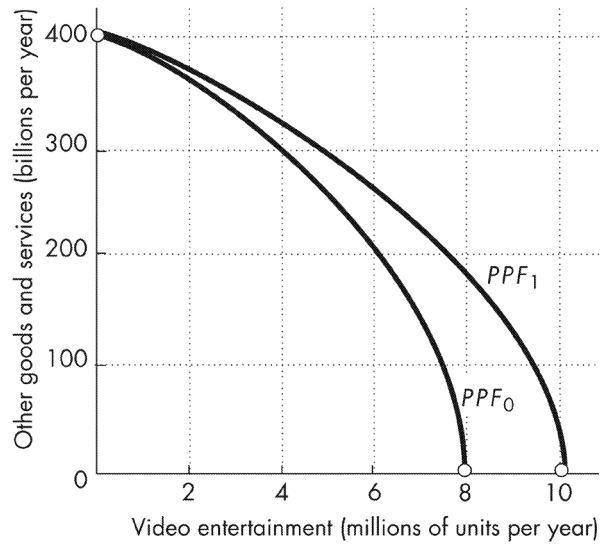
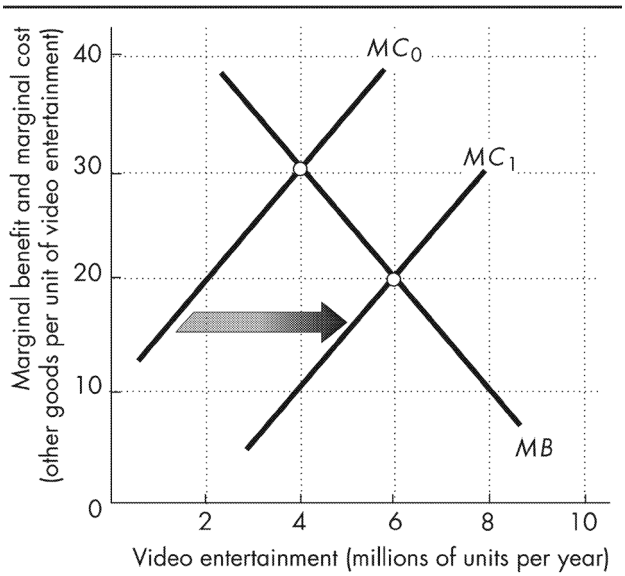


FIGURE **2.9**

Problem 26d



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introduction of live streaming does not change the marginal benefit of each additional unit of video entertainment. The marginal cost curve is an upward-sloping curve. Live steaming decreases the marginal cost of each additional unit of video entertainment. With live streaming the marginal cost curve shifts rightward from MC_0 to MC_1.

e. Explain how the efficient quantity of video entertainment has changed.

With live streaming, the marginal cost of producing video entertainment decreases. The marginal cost curve shifts rightward and the quantity of video entertainment that achieves allocative efficiency increases. In Figure 2.9, the efficient quantity of video entertainment increases from 4 million units a year to 6 million units a year.

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