SOLUTION MANUAL FOR MACROECONOMICS, 13TH EDITION MICHAEL PARKIN

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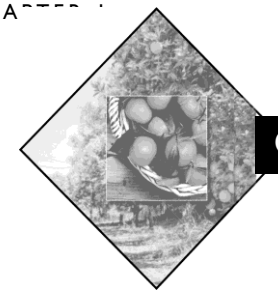

Chapter

WHAT IS ECONOMICS?

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Answers to the Review Quiz

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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 nice 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 extensive studying and extensive socializing.

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

   A headline in *The Baltimore Sun* on June 20, 2017 was "Davis Says Special Deployment Helped Stall Violence." The story presented Police Commissioner Kevin Davis stating that a week-long deployment of uniformed police officers on the streets of Baltimore helped reduce shootings in the city. But the story pointed out the role of scarcity when Commissioner Davis said that "the deployment was not sustainable over the long term" due to its cost.

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

   Microeconomics: On June 20, 2017 a headline in *East Bay Times* was "Reality vs Fantasy: FTC to Block FanDuel-DraftKings Merger." This story covers a microeconomic topic because it discusses how two online fantasy sports sites, which were trying to merge, now faced opposition by the Federal Trade Commission (FTC) which announced it would challenge the merger. *Macroeconomics*: On June 20, 2017, a headline in *The Wall Street Journal* was "Ryan Talks Up Likelihood of Tax Overhaul." This story covers a macroeconomic topic because it concerns taxes that affect every business and individual in the entire economy.

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

   What gets produced is significantly different today than in the past. Today the U.S. economy produces more services, such as medical operations, teaching, and hair styling, than goods, such as pizza,

automobiles, and computers. How goods and services are produced is by businesses determining how the factors of production, land, labor, 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. Labor's quality depends on people's human capital. In the U.S. economy, human capital obtained through schooling has increased over the years with far more people completing high school and attending college than in past years. Finally, for whom are goods and services to be produced depends on the way income is distributed to U.S. citizens. This distribution is not equal; the 20 percent of people with the lowest income earn about 5 percent of the nation's total income while the 20 percent of people with the highest incomes earn about 50 percent of total income. On the average, men earn more than women, whites more than non-whites, and college graduates more than high school graduates.

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 concerns the use of a school board's credit card to make personal purchases. A June 20, 2017 headline from *Star Tribune* was "Shakopee Board Approves Superintendent's Resignation Will Pay Him $50,000." This story discusses the superintendent's use of a school board credit card to buy items such as a television and trip to Nashville. The superintendent was following his self-interest because he may not have repaid the purchases had they not been uncovered. The school board chair said "In light of the current issues facing the school district, the school board feel (sic) that a change in leadership is warranted." The chair believes that the social interest is served by having a new superintendent without the issue of misuse of a credit card hanging over his or her head.

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

A tradeoff reflects the point that when someone gets one thing, something else must be given up. What is given up is the opportunity cost of whatever is obtained. Three examples of tradeoffs that are common to students include: a) When a student sleeps in rather than going to his or her early morning economics class, the student trades off additional sleep for study time. The opportunity cost of the decision is a lower grade on the exam. b) When a student running late for class parks his or her car illegally, the student trades off 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 off higher income by spending time during the day working at a part-time job for less time spent at leisure time and study. The opportunity cost for the higher income is less leisure and lower grades in classes.

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 of the different actions and then chooses the action that has the greatest benefit over cost for the person making the choice. Three rational choices made by students include: 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 the fact the student will have 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 cannot be both activities. What is lost is *only* the activity that otherwise would have been chosen—*either* sleeping in *or* jogging—which is whatever activity would have been chosen, that is, the most highly valued of the forgone alternatives. For students, attending class, doing homework, studying for a test are all activities with opportunity costs.

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 common examples students encounter 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 or her overall GPA. b) A college 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 from 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 benefits of different actions to their marginal costs. Therefore people's choices change when their incentives, that is the marginal benefit and/or marginal cost, of the choice changes. Just as everyone else, students respond to incentives; 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 a description of how the world *is*. It is testable. A *normative* statement is a description of how the world *ought to be*. It is, by its very nature, 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 or her 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 economic world. It includes only those features that are necessary to understand the issue under study. An economic model is designed to reflect those aspects of the world that are relevant to the user of the model and ignore the aspects that are irrelevant. A typical model is a GPS map. It reflects only those aspects of the real world that are relevant in assisting the user in reaching his or her destination and avoids using information irrelevant to travel.
3. How do economists try to disentangle cause and effect?
   Economists use models to understand some aspect of the economic world. Testing the predictions of models makes it necessary to disentangle cause and effect. To overcome this problem, economists have three methods of testing their models: Using a natural experiment, using a statistical investigation, and using economic experiments. A natural experiment is a situation that arises in the ordinary course of life in which one factor being studied varies and the other factors are the same. This method allows the economist to focus on the effect from the factor that differs between the two situations. A statistical investigation looks for correlations between variables but then determining whether the correlation actually reflects causation can be difficult. An economic experiment puts people into decision making situations and then varies the relevant factors one at a time to determine each factor's effect.
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

college, paying cash or credit for a purchase, and working. Businesses also use the concepts of marginal benefit and marginal cost when making decisions about what to produce, how to produce, and even how many hours to stay open. Finally governments also 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 Brazilian ethanol.

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1. What types of jobs do economists do?

   Economists are found in a large variety of jobs. Many of these jobs are analysts of various sorts. Some economists are market research analysts—they work with data on sales and try to predict a product's success and the price that should be set for it. Other economists are financial analysts—they work with data on interest rates, stock and bond prices to try to forecast the cost of borrowing the returns that can be expected on investments. Still other economists work as budget analysts—they use data on an organization's cash inflows (its receipts) and its outflows (its payments) in order to prepare plans forecasting future cash flows.

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

   Economists' pay ranges from $41,226 to $124,177 and has a median salary of $72,279. Students who earn a PhD in economics typically earn about $100,000 by mid-career. Economists who work as analysts have incomes that range from an average of $62,000 for market research analysts to $80,000 for financial analysts.

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

   Economists need five important skills:

   - Critical-thinking skills: Economists need the ability to use logical thinking to clarify and then solve real-world problems.
   - Analytical skills: Economists must be able to use economic ideas and tools to analyze data in order to determine important patterns and reach logical conclusions.
   - Math skills: Economists need to be able to use mathematical and statistical tools to explore and analyze data in order to reach valid conclusions.
   - Writing skills: Economists must be able to clearly write reports presenting ideas, conclusions from any analysis and reasons why the conclusions are valid.
   - Oral communication skills: Economists need the ability to orally explain ideas, conclusions, and the reasons why the conclusions are correct to a variety of people, including those with little knowledge of economics.

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 people's incentives to buy an iPod 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 decision because it affects a single company and a single market.
2. Which of the following pairs does not match?
   a. Labor and wages
      Labor 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. Starbucks Expands in China
      Starbucks' expansion is a decision made by Starbucks to further Starbucks' interest. Thus the decision is directly in Srarbucks' self interest. The social interest is affected because Starbucks' expansion will have an effect in China. For instance, more Chinese citizens might drink coffee rather than tea and fewer coffee shops run by Chinese firms might open.
   b. McDonald's Moves into Gourmet Coffee
      McDonald's decision to serve gourmet coffee is a decision made by McDonald's to further McDonald's interest. Thus the decision is directly in McDonald's self interest. The social interest is affected because more people will drink coffee rather than other drinks such as sodas.
   c. Food Must Be Labeled with Nutrition Data
      The decision to require that food must be labeled 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 MyEconLab Study Plan. Your grade on the test was 50 percent, lower than your usual 70 percent score.
   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.

5. Cost of Rio Olympics

Brazilian federal, state, and local governments spent R$2.8 billion and private sponsors spent R$4.2 billion on 17 new Olympic facilities, 10 of which will be used for sporting events after the Olympics.

Source: *Financial Times*, August 6, 2016

Was the opportunity cost of the Rio Olympics R$2.8 or R$7 billion? Explain your answer.

The R$7 billion spent on the 17 new Olympic facilities is an opportunity cost of the Olympics *if* the funds would not have spent otherwise. However, if there were already plans underway to build the 10 facilities that will be used after the Olympics, then their cost is not an opportunity cost of the Olympics because the cost would have been paid even if Rio did not host the Olympics.. The cost of the 7 facilities that will *not* be used afterwards, however, is definitely an opportunity cost of the Rio Olympics.

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

a. The United States should cut its imports.
   The statement is normative and cannot be tested.

b. China is the largest trading partner of the United States.
   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.

Answers to Additional Problems and Applications

7. **Kanye West Offers Free Concert Tickets**

Kanye West has teamed with Los Angeles inner-city schools to offer free passes for students.

Source: consequenceofsound.net, November 27, 2016

When Kanye West gave away tickets, what was free and what was scarce? Explain your answer.

The seats in the arenas are scarce—there are only a limited number. The time of school adminstrators used to distribute the tickets is also not free. In addition, if the students who are given the "free" ticket attended the concert rather than sell their free tickets, they incurred the opportunity cost of the foregone ticket price. So the concert was far from "free" for the concert-goers. The publicity that Kanye West receives is free to him but the publicity used reporters' scarce time to report on the tickets 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 affected in two ways. First, one good or service that is produced is the successful movie. Second, spinoffs (*Iron Man II*) and/or similar films likely will be created in the future. The "how" question is affected to the extent that movies use different production methods. Some movies, for instance, 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 so that more goods and services are produced for them.

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

The a successful movie increases the income of the people involved with the movie. Hence these people's choices are driven largely by self interest. However 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 also reflected choices made 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 salary that must be paid to Chris Pratt to appear in future movies increased because some of the success of *Guardians of the Galaxy* was attributed to Mr. Pratt. As a result the opportunity cost to movie producers of hiring Mr. Pratt increased.

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

    There are two effects on the incentives of producers to hire Mr. Pratt. First, because the opportunity cost of hiring Mr. Pratt increased, the incentive to hire him decreased. However because part of the success of *Guardians of the Galaxy* was attributed to Mr.

Pratt acting in the leading role, producers expect that his acting will lead to increased success for future movies. This belief increases producers' incentives to hire Mr. Pratt.

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/or retaining eligibility for a scholarship are examples of incentives that encourage taking summer classes. The benefits of taking summer classes might include early graduation, more personal attention from the instructor, retained eligibility for a scholarship, and increased knowledge about some aspect of the world. Costs potentially include forgone summer jobs or internships, less time to spend with friends, and additional tuition and other class-related expenses if the class I not one that would be taken otherwise. The choice is rational as long as the student determines that taking summer classes offers the highest benefit over cost for the use of his or time and efforts.

12. Look at today's *Wall Street Journal.* What is the leading economic news story? With big economic questions and tradeoffs does it discuss or imply?

On June 20, 2017, the top economic news story discussed the Senates plan to vote on legislation repealing large parts of the Affordable Care Act. One option under consideration would cap the amount the federal government would pay toward the cost of Medicaid, the program that pays for healthcare for poor and disabled people.
This story clearly discusses the "for whom" question: If Medicaid spending is reduced, fewer poor and disabled people will receive certain types of healthcare. It also discusses the "what" question: If fewer Americans have health insurance, less goods and services related to health care will be produced.
The story implicitly illustrates a tradeoff: If choices are taken to limit the amount of healthcare poor and disabled people receive, their health will generally be worse than otherwise.

13. Provide two microeconomic statements and two macroeconomic statements. Classify your statements as positive or normative, and explain your classifications.

Microeconomic statements are: Fewer deep water oil wells should be drilled in the Gulf of Mexico. 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 currently unemployment rate is too high. The current unemployment rate is higher for blacks than for whites. 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.

Appendix

1 GRAPHS IN ECONOMICS

Answers to the Review Quiz

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1. Explain how we "read" the three 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 origin to the point. Similarly, the quantity of the variable measured on the vertical axis (the *y*-axis) is measured by the vertical distance from the origin to the point. The point relates these two quantities. For instance, in Figure A1.2, point *A* shows that at a price of $8.43 per ticket, 1.3 billion tickets are sold.

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

   Scatter diagrams plot the value of one economic 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. Moreover, if a relationship exists, scatter diagrams show whether increases in one variable are associated with increases or decreases in the other variable.

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 a film's worldwide box office ticket sales and the film's production budget. The figure shows that higher box office sales are associated with a higher production budget.

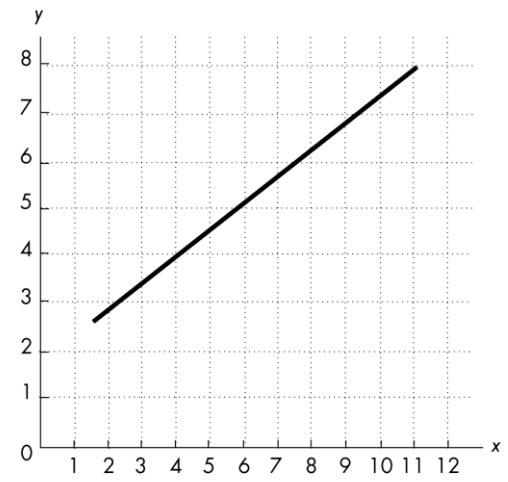
The scatter diagram in Figure A1.4a shows the relationship between income, in thousands of dollars per year, and expenditure, also in thousands of dollars per year, for the years 2001 to 2016. The scatter diagram shows that higher income leads to higher expenditure. The figure also shows that the relationship is relatively strong.

The scatter diagram in Figure A1.4b shows the relationship between the inflation rate and the unemployment rate for the years 2001 to 2016. The figure shows that for most of the years, there was a weak relationship between these variables, with perhaps higher inflation being associated with lower unemployment.

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. Figure A1.1 illustrates such a relationship.

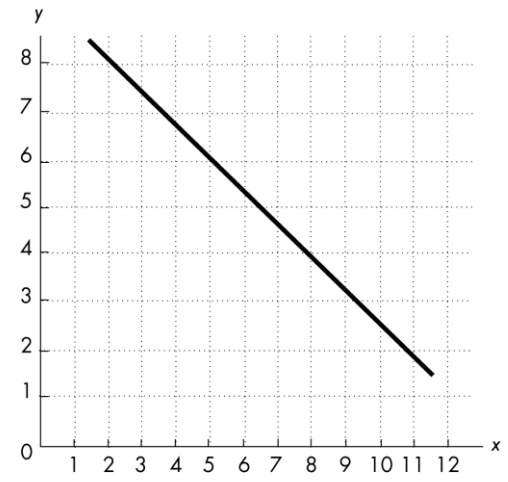
FIGURE A1.1
Review problem 4



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 the opposite directions is shown by a line that slopes downward. Figure A1.2 illustrates such a relationship.

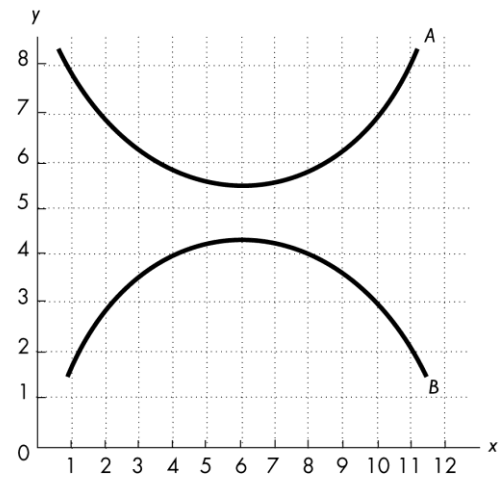
FIGURE A1.2
Review problem 5



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

A graph that shows the relationship between two variables that have a maximum is shown by a line that starts out sloping upward, reaches a maximum, and then slopes downward. Figure A1.3 illustrates such a relationship with curve *B*. A graph that shows the relationship between two variables that have a minimum is shown by a line that starts out sloping downward, reaches a minimum, and then slopes upward. Figure A1.3 illustrates such a relationship with curve *A*.

FIGURE **A1.3**
Review problem 6



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 the opposite directions is a negative relationship.

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 on one of the axes changes while all of the other relevant variables not graphed on the axes do not change. The movement along the curve shows the effect of the variable that changes, *ceteris paribus* (holding all of the other non-graphed variables constant).

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. In this case the entire curve shifts.

Answers to the Study Plan Problems and Applications

Use the spreadsheet to work Problems 1 to 3. The spreadsheet provides data on the U.S. economy: 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	2006	2.5	4.9	2.7	4.6
2	2007	4.1	4.5	1.8	4.6
3	2008	0.1	1.4	−0.3	5.8
4	2009	2.7	0.2	−2.8	9.3
5	2010	1.5	0.1	2.5	9.6
6	2011	3.0	0.1	1.6	8.9
7	2012	1.7	0.1	2.2	8.1
8	2013	1.5	0.1	1.7	7.4
9	2014	0.8	0.0	2.4	6.2
10	2015	0.7	0.1	2.6	5.3
11	2016	2.1	0.3	1.6	4.9

FIGURE **A1.4**
Problem 1

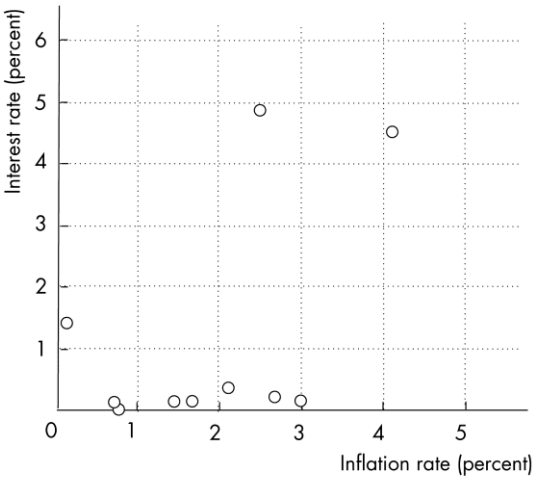
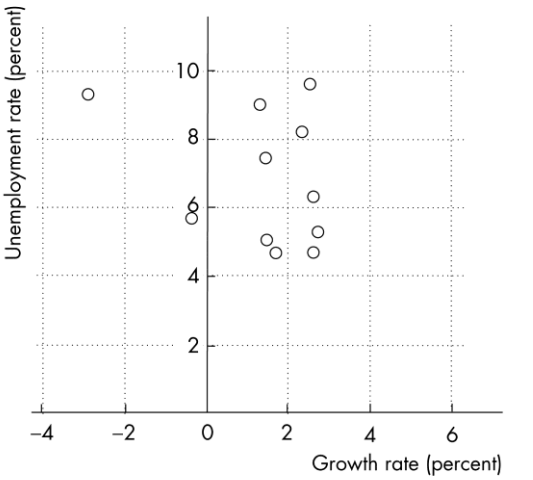


FIGURE **A1.5**
Problem 2



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 inflation rate on the *x*-axis and the interest rate on the *y*-axis. The graph will be a set of dots and is shown in Figure A1.4. The pattern made by the dots tells us that as the inflation rate increases, the interest rate usually increases so there is a (weak) positive relationship.

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

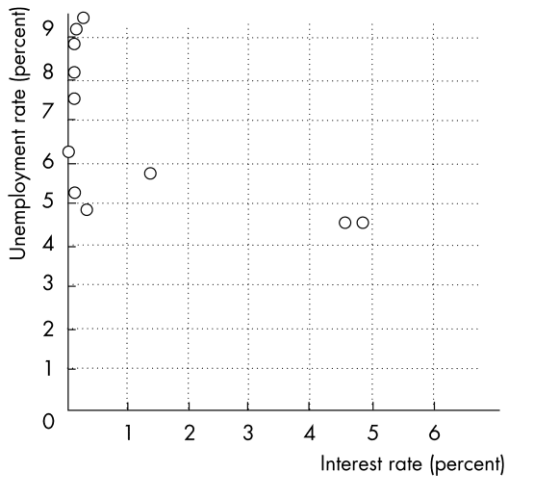
   To make a scatter diagram of the growth rate and the unemployment rate, plot the growth rate on the *x*-axis and the unemployment rate on the *y*-axis. The graph will be a set of dots and is shown in

Figure A1.5. The pattern made by the dots tells us that when the growth rate increases, the unemployment rate usually decreases so there is a negative relationship.

3. Draw a scatter diagram of the interet 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 and is shown in Figure A1.6. 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.

FIGURE **A1.6**
Problem 3



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

***Lego* Shatters More Records:**

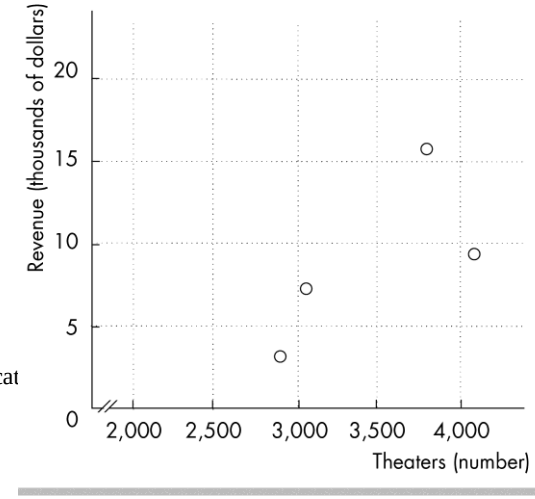
Source: Boxofficemojo.com,
Data for weekend of March 10-12, 2017

Movie	Theaters (number)	Revenue (dollars per theater)
Kong: Skull Island	3,846	$15,867
Logan	4,071	$9,362
Get Out	3,143	$6,600
The Shack	2,888	$3,465

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

Figure A1.7 shows the relationship. As the figure shows, there is a positive relationship.

FIGURE **A1.7**
Problem 4



5. Calculate the slope of the relationship in Problem 4 between 3,846 and 4,071 theaters.

The slope equals the change in revenue per theater divided by the change in the number of theaters. The slope equals ($15,867 – $9,362)/(3,846 – 4,071) which equals –$28.91 per theater.

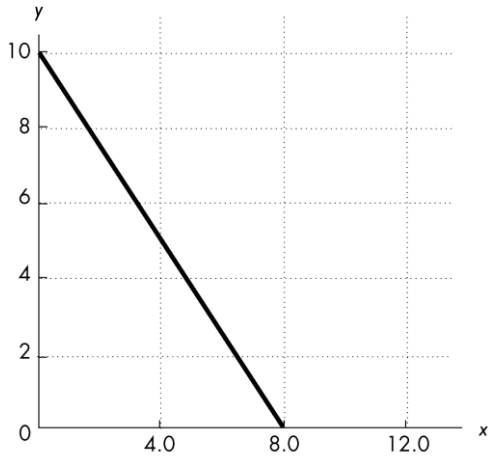
6. Calculate the slope of the relationship in Problem 4 between 4,071 and 3,143 theaters.

The slope equals the change in revenue per theater divided by the change in the number of theaters. The slope equals ($9,362 − $6,600)/(4,071 − 3,143 which equals $2.98 per theater.

7. Calculate the slope of the relationship shown in Figure A1.8.

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 on the *y*-axis divided by the change in the variable on the *x*-axis. To calculate the slope, you must 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. Therefore the slope of the curve equals −10/8, which equals −5/4.

FIGURE **A1.8**
Problem 7



Use the relationship shown in Figure A1.9 to work 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.

Similarly, the slope at point *B* is −0.25. 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.

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