Chapter 1

Problems and Applications

1. a. When welfare recipients have their benefits cut off after two years, they have a greater incentive to find jobs than if their benefits were to last forever.

b. The loss of benefits means that someone who cannot find a job will get no income at all, so the distribution of income will become less equal. But the economy will be more efficient, because welfare recipients have a greater incentive to find jobs. Thus, the change in the law is one that increases efficiency but reduces equality.

2. If you spend $100 now instead of saving it for a year and earning 5 percent interest, you are giving up the opportunity to spend $105 a year from now.

3. a. The provision of Social Security benefits lowers an individual’s incentive to save for retirement. The benefits provide some level of income to the individual when he or she retires. This means that the individual is not entirely dependent on savings to support consumption through the years in retirement.

b. Since a person gets fewer after-tax Social Security benefits the greater his or her earnings are, there is an incentive not to work (or not work as much) after age 65. The more you work, the lower your after-tax Social Security benefits will be. Thus, the taxation of Social Security benefits discourages work effort after age 65.

4. If you are thinking of going skiing instead of working at your part-time job, the cost of skiing includes its monetary and time costs, which includes the opportunity cost of the wages you are giving up by not working. If the choice is between skiing and going to the library to study, then the cost of skiing is its monetary and time costs including the cost of getting lower grades in your courses.

5. Harry suggests looking at whether productivity would rise or fall. Productivity is certainly important, since the more productive workers are, the lower the cost per gallon of potion. Ron wants to look at average cost. But both Harry and Ron are missing the other side of the equation—revenue. A firm wants to maximize its profits, so it needs to examine both costs and revenues. Thus, Hermione is right—it is best to examine whether the extra revenue would exceed the extra costs. Hermione is the only one who is thinking at the margin.

6. When the benefits of something are psychological, such as going on a vacation, it is not easy to compare benefits to costs to determine if it is worth doing. But there are two ways to think about the benefits. One is to compare the vacation with what you would do in its place. If you did not go on vacation, would you buy something like a new set of golf clubs? Then you can decide if you would rather have the new clubs or the vacation. A second way is to think about how hard you had to work to earn the money to pay for the vacation. You can then decide if the psychological benefits of the vacation were worth the psychological cost of working.

7. The fact that you have already sunk $5 million is not relevant to your decision anymore, because that money is gone. What matters now is the chance to earn profits at the margin. If you spend another $1 million and can generate sales of $3 million, you’ll earn $2 million in marginal profit, so you should do so. You are right to think that the project has lost a total of $3 million ($6 million in costs and only $3 million in revenue) and you should not have started it. That is true, but if you do not spend the additional $1 million, you will not have any sales and your losses will be $5 million. So what matters is not the total profit, but the profit you can earn at the margin. In fact, you would pay up to $3 million to complete development; any more than that, and you will not be increasing profit at the margin.

8. a. A family deciding whether to buy a new car faces a trade-off between the cost of the car and other things they might want to buy. For example, buying the car might mean they must give up going on vacation for the next two years. So the real cost of the car is the family’s opportunity cost in terms of what they must give up.
b. For a member of Congress deciding whether to increase spending on national parks, the trade-off is between parks and other spending items or tax cuts. If more money goes into the park system, that may mean less spending on national defense or on the police force. Or instead of spending more money on the park system, taxes could be reduced.

c. When a company president decides whether to open a new factory, the decision is based on whether the new factory will increase the firm’s profits compared to other alternatives. For example, the company could upgrade existing equipment or expand existing factories. The bottom line is: Which method of expanding production will increase profit the most?

d. In deciding how much to prepare for class, a professor faces a trade-off between the value of improving the quality of the lecture compared to other things she could do with her time, such as working on additional research.

e. In deciding whether to go to graduate school, the student faces a trade-off between her possible earnings with a bachelor’s degree and the benefits of an increased education (such as higher future earnings and greater knowledge).

9. By specializing in each task, you and your roommate can finish the chores more quickly. If you divided each task equally, it would take you more time to cook than it would take your roommate, and it would take him more time to clean than it would take you. By specializing, you reduce the total time spent on chores.

Similarly, countries can specialize and trade, making both better off. For example, suppose it takes Spanish workers less time to make clothes than it takes French workers, and French workers can make wine more efficiently than Spanish workers can. Then Spain and France can both benefit if Spanish workers produce all the clothes and French workers produce all the wine, and they exchange wine for clothes.

10. To produce the right number of CDs by the right artists and deliver them to the consumers requires an enormous amount of information. You need to know about production techniques and costs in the CD industry. You need to know each consumer’s musical tastes and which artists they want to hear. If you make the wrong decisions, you will be producing too many CDs by artists that consumers do not want to hear, and not enough by others. It would be difficult to do this job well.

11. a. Efficiency: The market failure comes from the market power of the cable TV firm.

b. Equity

c. Efficiency: An externality arises because secondhand smoke harms nonsmokers.

d. Efficiency: The market failure occurs because of Standard Oil’s market power.

e. Equity

f. Efficiency: There is an externality because of accidents caused by drunk drivers.

12. a. If everyone were guaranteed the best healthcare possible, much more of our nation’s output would be devoted to medical care than is now the case. Would that be efficient? If you believe that doctors have market power and restrict health care to keep their incomes high, you might think efficiency would increase by providing more healthcare. But more likely, if the government mandated increased spending on healthcare, the economy would be less efficient because it
would give people more healthcare than they would choose to pay for. From the point of view of equality, if poor people are less likely to have adequate healthcare, providing more health care would represent an improvement. Each person would have a more even slice of the economic pie, though the pie would consist of more healthcare and less of other goods.

b. When workers are laid off, equality considerations argue for the unemployment benefits system to provide them with some income until they can find new jobs. After all, no one plans to be laid off, so unemployment benefits are a form of insurance. But there is an efficiency problem—why work if you get income for doing nothing? The economy is not operating efficiently if people remain unemployed for a long time, and unemployment benefits encourage unemployment. Thus, there is a trade-off between equality and efficiency. The more generous unemployment benefits are, the less income is lost by an unemployed person, but the more that person is encouraged to remain unemployed. So greater equality reduces efficiency.

13. Because average income in the United States has roughly doubled every 35 years, we are likely to have a better standard of living than our parents, and a much better standard of living than our grandparents. This is mainly the result of increased productivity, so that an hour of work produces more goods and services than it used to. Thus, incomes have continuously risen over time, as has the standard of living.

14. If Americans save more and it leads to more spending on factories, there will be an increase in production and productivity, because the same number of workers will have more equipment to work with. The benefits from higher productivity will go to both the workers, who will get paid more because they are producing more, and the factory owners, who will get a return on their investments. There is no such thing as a free lunch, however, because when people save more, they are giving up spending. They get higher incomes at the cost of buying fewer goods.

15. When governments print money, they impose a “tax” on anyone who is holding money, because the value of money is decreased.

16. To make an intelligent decision about whether to reduce inflation, a policymaker would need to know what causes inflation and unemployment, as well as what determines the trade-off between them. This means that the policymaker needs to understand how households and firms will adjust to a decrease in the money supply. How much will spending decline? How much will firms lower output? Any attempt to reduce inflation will likely lead to higher unemployment in the short run. A policymaker thus faces a trade-off between the benefits of lower inflation compared to the cost of higher unemployment.

Chapter 2

Problems and Applications

1. As the president, you would be interested in both the positive and normative views of economists, but you would probably be most interested in their positive views. Economists are on your staff to provide their expertise about how the economy works. They know many facts about the economy and the interaction of different sectors. So you would be most likely to call on them about questions of fact—positive analysis. Since you are the president, you are the one who has to make the normative statements as to what should be done, with an eye to the political consequences. The normative statements made by economists represent their own views, not necessarily your views or the electorate’s views.

2. a. The statement that society faces a short-run trade-off between inflation and unemployment is a positive statement. It deals with how the economy is, not how it should be. Since economists have examined data and found that there is a short-run negative relationship between inflation and unemployment, the statement is a fact, thus it is a positive statement.
b. The statement that a reduction in the rate of money growth will reduce the rate of inflation is a positive statement. Economists have found that money growth and inflation are very closely related. The statement thus tells how the world is, and so it is a positive statement.

c. The statement that the Federal Reserve should reduce the rate of money growth is a normative statement. It states an opinion about something that should be done, not how the world is.

d. The statement that society ought to require welfare recipients to look for jobs is a normative statement. It does not state a fact about how the world is. Instead, it is a statement of how the world should be and is thus a normative statement.

e. The statement that lower tax rates encourage more work and more saving is a positive statement. Economists have studied the relationship between tax rates and work, as well as the relationship between tax rates and saving. They have found a negative relationship in both cases. So the statement reflects how the world is and is thus a positive statement.

3. a. A: 40 lawns mowed; 0 washed cars
   B: 0 lawns mowed, 40 washed cars
   C: 20 lawns mowed; 20 washed cars
   D: 25 lawns mowed; 25 washed cars

![Figure 8](image)

b. The production possibilities frontier is shown in Figure 8. Points A, B, and D are on the frontier, while point C is inside the frontier.

c. Larry is equally productive at both tasks. Moe is more productive at washing cars, while Curly is more productive at mowing lawns.

d. Allocation C is inefficient. More washed cars and mowed lawns can be produced by simply reallocating the time of the three individuals.
4. a. Figure 6 shows a production possibilities frontier between guns and butter. It is bowed out because the opportunity cost of butter depends on how much butter and how many guns the economy is producing. When the economy is producing a lot of butter, workers and machines best suited to making guns are being used to make butter, so each unit of guns given up yields a small increase in the production of butter. Thus, the frontier is steep and the opportunity cost of producing butter is high. When the economy is producing a lot of guns, workers and machines best suited to making butter are being used to make guns, so each unit of guns given up yields a large increase in the production of butter. Thus, the frontier is very flat and the opportunity cost of producing butter is low.

[Diagram of production possibilities frontier]

b. Point A is impossible for the economy to achieve; it is outside the production possibilities frontier. Point B is feasible but inefficient because it is inside the production possibilities frontier.

c. The Hawks might choose a point like H, with many guns and not much butter. The Doves might choose a point like D, with a lot of butter and few guns.

d. If both Hawks and Doves reduced their desired quantity of guns by the same amount, the Hawks would get a bigger peace dividend because the production possibilities frontier is much flatter at point H than at point D. As a result, the reduction of a given number of guns, starting at point H, leads to a much larger increase in the quantity of butter produced than when starting at point D.

5. Five of the statements in Table 1 are clearly normative. They are: "5. The United States should not restrict employers from outsourcing work to foreign countries." "6. The United States should eliminate agricultural subsidies." "7. Local and state governments should eliminate subsidies to professional sports franchises." "8. If the federal budget is to be balanced, it should be done over the business cycle rather than yearly" and "13. The government should restructure the welfare system along the lines of a 'negative income tax.'" Both are suggestions of changes that should be made, rather than statements of fact, so they are clearly normative statements.

The other statements in the table are positive. All the statements concern how the world is, not how the world should be. They can each be evaluated using data.
6. See Figure 5; the four transactions are shown.

![Diagram showing two markets: Goods and Services, Factors of Production. Transactions include:
- Firms: a. Quart of milk, c. $30, a. $1
- Households: c. $30, a. $1
- Markets for Factors of Production: b. Acme’s capital, d. One hour of work, b. $10,000, d. $4.50

**Figure 5**

7. a. A family’s decision about how much income to save is related to microeconomics.
b. The effect of government regulations on auto emissions is related to microeconomics.
c. The impact of higher saving on economic growth is related to macroeconomics.
d. A firm’s decision about how many workers to hire is related to microeconomics.
e. The relationship between the inflation rate and changes in the quantity of money is related to macroeconomics.

8. See Figure 7. The shape and position of the frontier depend on how costly it is to maintain a clean environment—the productivity of the environmental industry. Gains in environmental productivity, such as the development of new way to produce electricity that emits fewer pollutants, lead to shifts of the production-possibilities frontier, like the shift from PPF\textsubscript{1} to PPF\textsubscript{2} shown in the figure.

![Diagram showing two production frontiers: PPF\textsubscript{1} and PPF\textsubscript{2}. The Cleanliness of Environment is on the y-axis, and Quantity of Industrial Output is on the x-axis.]

**Figure 7**

9. There are many possible answers.
Chapter 3

Problems and Applications

1. This pattern of trade is consistent with the principle of comparative advantage. If the United States exports corn and aircraft, it must have a comparative advantage in the production of these goods. Because it imports oil and clothing, the United States must have a comparative disadvantage in the production of these items.

2. a. Because a Canadian worker can make either two cars a year or 30 bushels of wheat, the opportunity cost of a car is 15 bushels of wheat. Similarly, the opportunity cost of a bushel of wheat is 1/15 of a car. The opportunity costs are the reciprocals of each other.

b. See Figure 4. If all ten million workers produce two cars each, they produce a total of 20 million cars, which is the vertical intercept of the production possibilities frontier. If all ten million workers produce 30 bushels of wheat each, they produce a total of 300 million bushels, which is the horizontal intercept of the production possibilities frontier. Because the trade-off between cars and wheat is always the same, the production possibilities frontier is a straight line.

If Canada chooses to consume ten million cars, it will need five million workers devoted to car production. That leaves five million workers to produce wheat, who will produce a total of 150 million bushels (five million workers times 30 bushels per worker). This is shown as point A on Figure 4.
c. If the United States buys 10 million cars from Canada and Canada continues to consume 10 million cars, then Canada will need to produce a total of 20 million cars. So Canada will be producing at the vertical intercept of the production possibilities frontier. However, if Canada gets 20 bushels of wheat per car, it will be able to consume 200 million bushels of wheat, along with the 10 million cars. This is shown as point B in the figure. Canada should accept the deal because it gets the same number of cars and 50 million more bushels of wheat.

![Figure 4](image)

3. a. True; two countries can achieve gains from trade even if one of the countries has an absolute advantage in the production of all goods. All that is necessary is that each country have a comparative advantage in some good.

b. False; it is not true that some people have a comparative advantage in everything they do. In fact, no one can have a comparative advantage in everything. Comparative advantage reflects the opportunity cost of one good or activity in terms of another. If you have a comparative advantage in one thing, you must have a comparative disadvantage in the other thing.

c. False; it is not true that if a trade is good for one person, it cannot be good for the other one. Trades can and do benefit both sides—especially trades based on comparative advantage. If both sides did not benefit, trades would never occur.

d. False; to be good for both parties, the trade price must lie between the two opportunity costs.

e. False; trade that makes the country better off can harm certain individuals in the country. For example, suppose a country has a comparative advantage in producing wheat and a comparative disadvantage in producing cars. Exporting wheat and importing cars will benefit the nation as a whole, as it will be able to consume more of all goods. However, the introduction of trade will likely be harmful to domestic auto workers and manufacturers.
4. a. English workers have an absolute advantage over Scottish workers in producing scones, because English workers produce more scones per hour (50 vs. 40). Scottish workers have an absolute advantage over English workers in producing sweaters, because Scottish workers produce more sweaters per hour (2 vs. 1). Comparative advantage runs the same way. English workers, who have an opportunity cost of 1/50 sweater per scone (1 sweater per hour divided by 50 scones per hour), have a comparative advantage in scone production over Scottish workers, who have an opportunity cost of 1/20 sweater per scone (2 sweaters per hour divided by 40 scones per hour). Scottish workers, who have an opportunity cost of 20 scones per sweater (40 scones per hour divided by 2 sweaters per hour), have a comparative advantage in sweater production over English workers, who have an opportunity cost of 50 scones per sweater (50 scones per hour divided by 1 sweater per hour).

b. If England and Scotland decide to trade, Scotland will produce sweaters and trade them for scones produced in England. A trade with a price between 20 and 50 scones per sweater will benefit both countries, as they will be getting the traded good at a lower price than their opportunity cost of producing the good in their own country.

c. Even if a Scottish worker produced just one sweater per hour, the countries would still gain from trade, because Scotland would still have a comparative advantage in producing sweaters. Its opportunity cost for sweaters would be higher than before (40 scones per sweater, instead of 20 scones per sweater before). But there are still gains from trade because England has a higher opportunity cost (50 scones per sweater).

5. a. The production possibilities frontiers for the two countries are shown in Figure 5. If, without trade, a U.S. worker spends half of his time producing each good, the United States will have 50 shirts and 10 computers. If, without trade, a worker in China spends half of his time producing each good, China will have 50 shirts and 5 computers.

![Figure 5](image)

b. For the United States, the opportunity cost of one computer is five shirts, while the opportunity cost of one shirt is 1/5 computer. For China, the opportunity cost of one computer is ten shirts, while the opportunity cost of one shirt is 1/10 computer. Therefore, the United States has a comparative advantage in the production of computers and China has a comparative advantage in the production of shirts.
China would export shirts. The price of a shirt will fall between 1/5 and 1/10 of a computer. An example would be a price of 1/8 computer. In other words, China could export eight shirts and receive one computer in return. Both countries would benefit from trade. China would specialize in shirts (producing 100) and export eight. This would leave them with 92 shirts. In return, they would get one computer. The combination of 92 shirts and 1 computer was not available to China before trade. The United States could specialize in computers (producing 20) and export one computer to China in exchange for eight shirts. The United States would end up with 19 computers and 8 shirts, a combination that was impossible without trade.

c. The price of a computer would fall between five and ten shirts. If the price was below five, the United States would not be willing to export computers because the opportunity cost of a shirt for the United States is 1/5 computer. If the price was greater than ten shirts, China would not be willing to import computers because (for China) the opportunity cost of a computer is ten shirts.

d. Once the productivity is the same in the two countries, the benefits of trade disappear. Trade is beneficial because it allows countries to exploit their comparative advantage. If China and the United States have exactly the same opportunity cost of producing shirts and computers, there will be no more gains from trade available.

6. a. Pat's opportunity cost of making a pizza is one-half gallon of root beer, because she could brew one-half gallon in the time (two hours) it takes her to make a pizza. Pat has an absolute advantage in making pizza because she can make one in two hours, while it takes Kris four hours. Kris' opportunity cost of making a pizza is two-thirds gallon of root beer, because she could brew two-thirds of a gallon in the time (four hours) it takes her to make a pizza. Because Pat's opportunity cost of making pizza is less than Kris', Pat has a comparative advantage in making pizza.

b. Because Pat has a comparative advantage in making pizza, she will make pizza and exchange it for root beer that Kris makes.

c. The highest price of pizza in terms of root beer that will make both roommates better off is two-thirds of a gallon of root beer. If the price were higher than that, then Kris would prefer making her own pizza (at an opportunity cost of two-thirds of a gallon of root beer) rather than trading for pizza that Pat makes. The lowest price of pizza in terms of root beer that will make both roommates better off is one-half gallon of root beer. If the price were lower than that, then Pat would prefer making her own root beer (she can make one-half gallon of root beer instead of making a pizza) rather than trading for root beer that Kris makes.

7. a. An average worker in Brazil has an absolute advantage in the production of coffee because he requires less time than an average worker in Peru.

b. An average worker in Peru has a comparative advantage in the production of coffee. The opportunity cost of each ounce of coffee for the average worker in Peru (1.5 ounces of soybeans) is lower than the opportunity cost of each ounce of coffee for the average worker in Brazil (3 ounces of soybeans).

c. Brazil will import coffee from Peru because Peru has a comparative advantage in the production of coffee.
The price of 2 ounces of soybeans for every ounce of coffee falls between the two opportunity costs.

<table>
<thead>
<tr>
<th>Workers needed to make:</th>
<th>One Car</th>
<th>One Ton of Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>1/4</td>
<td>1/10</td>
</tr>
<tr>
<td>Japan</td>
<td>1/4</td>
<td>1/5</td>
</tr>
</tbody>
</table>

See Figure 3. With 100 million workers and four cars per worker, if either economy were devoted completely to cars, it could make 400 million cars. Because a U.S. worker can produce 10 tons of grain, if the United States produced only grain it would produce 1,000 million tons. Because a Japanese worker can produce 5 tons of grain, if Japan produced only grain it would produce 500 million tons. These are the intercepts of the production possibilities frontiers shown in the figure. Note that because the trade-off between cars and grain is constant for both countries, the production possibilities frontiers are straight lines.

Figure 3

Because a U.S. worker produces either four cars or ten tons of grain, the opportunity cost of one car is two and one-half tons of grain, which is ten divided by four. Because a Japanese worker produces either four cars or five tons of grain, the opportunity cost of one car is one and one-fourth tons of grain, which is five divided by four. Similarly, the U.S. opportunity cost of one ton of grain is 2/5 car (4 divided by 10) and the Japanese opportunity cost of one ton of grain is 4/5 car (4 divided by 5). This results in the following table:
<table>
<thead>
<tr>
<th>Opportunity Cost of:</th>
<th>One Car (in terms of tons of grain given up)</th>
<th>One Ton of Grain (in terms of cars given up)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>2 1/2</td>
<td>2/5</td>
</tr>
<tr>
<td>Japan</td>
<td>1 1/4</td>
<td>4/5</td>
</tr>
</tbody>
</table>

d. Neither country has an absolute advantage in producing cars, because they are equally productive (the same output per worker); the United States has an absolute advantage in producing grain, because it is more productive (greater output per worker).

e. Japan has a comparative advantage in producing cars, because it has a lower opportunity cost in terms of grain given up. The United States has a comparative advantage in producing grain, because it has a lower opportunity cost in terms of cars given up.

f. With half the workers in each country producing each of the goods, the United States would produce 200 million cars (50 million workers times 4 cars each) and 500 million tons of grain (50 million workers times 10 tons each). Japan would produce 200 million cars (50 million workers times 4 cars each) and 250 million tons of grain (50 million workers times 5 tons each).

g. From any situation with no trade, in which each country is producing some cars and some grain, suppose the United States changed one worker from producing cars to producing grain. That worker would produce four fewer cars and ten additional tons of grain. Then suppose the United States offers to trade seven tons of grain to Japan for four cars. The United States will do this because it values four cars at ten tons of grain, so it will be better off if the trade goes through. Suppose Japan changes one worker from producing grain to producing cars. That worker would produce four more cars and five fewer tons of grain. Japan will take the trade because it values four cars at five tons of grain, so it will be better off. With the trade and the change of one worker in both the United States and Japan, each country gets the same amount of cars as before and both get additional tons of grain (three for the United States and two for Japan). Thus, by trading and changing their production, both countries are better off.

9. a. With no trade, one pair of white socks trades for one pair of red socks in Boston, because productivity is the same for the two types of socks. The price in Chicago is two pairs of red socks per pair of white socks.

b. Boston has an absolute advantage in the production of both types of socks, because a worker in Boston produces more (three pairs of socks per hour) than a worker in Chicago (two pairs of red socks per hour or one pair of white socks per hour).

Chicago has a comparative advantage in producing red socks, because the opportunity cost of producing a pair of red socks in Chicago is one-half pair of white socks, while the opportunity cost of producing a pair of red socks in Boston is one pair of white socks.

Boston has a comparative advantage in producing white socks, because the opportunity cost of producing a pair of white socks in Boston is one pair of red socks, while the opportunity cost of producing a pair of white socks in Chicago is two pairs of red socks.

c. If they trade socks, Boston will produce white socks for export, because it has the comparative advantage in white socks, while Chicago produces red socks for export, which is Chicago’s comparative advantage.
d. Trade can occur at any price between one and two pairs of red socks per pair of white socks. At a price lower than one pair of red socks per pair of white socks, Boston will choose to produce its own red socks (at a cost of one pair of red socks per pair of white socks) instead of buying them from Chicago. At a price higher than two pairs of red socks per pair of white socks, Chicago will choose to produce its own white socks (at a cost of two pairs of red socks per pair of white socks) instead of buying them from Boston.

10. a. See Figure 2. If Maria spends all five hours studying economics, she can read 100 pages, so that is the vertical intercept of the production possibilities frontier. If she spends all five hours studying sociology, she can read 250 pages, so that is the horizontal intercept. The opportunity costs are constant, so the production possibilities frontier is a straight line.

![Figure 2](image)

b. It takes Maria two hours to read 100 pages of sociology. In that time, she could read 40 pages of economics. So the opportunity cost of 100 pages of sociology is 40 pages of economics.
Chapter 4

Problems and Applications

1. a. Reduced police efforts would lead to an increase in the supply of drugs. As Figure 26 shows, this would cause the equilibrium price of drugs to fall and the equilibrium quantity of drugs to rise.

![Graph showing the effect of increased supply on price and quantity of illegal drugs.]

On the other hand, cutbacks in education efforts would lead to a rise in the demand for drugs. This would push the equilibrium price and quantity up, as shown in Figure 27.

![Graph showing the effect of increased demand on price and quantity of illegal drugs.]

b. A fall in the equilibrium price would lead us to believe the first hypothesis. If the equilibrium price rose, we would believe the second hypothesis.

2. If the demand for bread falls, the equilibrium price of bread does indeed fall. However, the price decrease causes a rise in quantity of bread demanded (illustrated by a movement along the new demand curve).

3. a. When a hurricane in South Carolina damages the cotton crop, it raises input prices for producing sweatshirts. As a result, the supply of sweatshirts shifts to the left, as shown in Figure 22. The new equilibrium price is higher and the new equilibrium quantity of sweatshirts is lower.
b. A decline in the price of leather jackets leads more people to buy leather jackets, reducing the demand for sweatshirts. The result, shown in Figure 23, is a decline in both the equilibrium price and quantity of sweatshirts.

c. The effects of colleges requiring students to engage in morning exercise in appropriate attire raises the demand for sweatshirts, as shown in Figure 24. The result is an increase in both the equilibrium price and quantity of sweatshirts.
d. The invention of new knitting machines increases the supply of sweatshirts. As Figure 25 shows, the result is a reduction in the equilibrium price and an increase in the equilibrium quantity of sweatshirts.
4. a. If people decide to have more children, they will want larger vehicles for hauling their kids around, so the demand for minivans will increase. Supply will not be affected. The result is a rise in both the price and the quantity sold, as Figure 12 shows.

![Figure 12](image)

b. If a strike by steelworkers raises steel prices, the cost of producing a minivan rises and the supply of minivans decreases. Demand will not be affected. The result is a rise in the price of minivans and a decline in the quantity sold, as Figure 13 shows.

![Figure 13](image)
c. The development of new automated machinery for the production of minivans is an improvement in technology. This reduction in firms' costs will result in an increase in supply. Demand is not affected. The result is a decline in the price of minivans and an increase in the quantity sold, as Figure 14 shows.

![Figure 14](image)

d. The rise in the price of sport utility vehicles affects minivan demand because sport utility vehicles are substitutes for minivans. The result is an increase in demand for minivans. Supply is not affected. The equilibrium price and quantity of minivans both rise, as Figure 12 shows.

e. The reduction in peoples' wealth caused by a stock-market crash reduces their income, leading to a reduction in the demand for minivans, because minivans are likely a normal good. Supply is not affected. As a result, both the equilibrium price and the equilibrium quantity decline, as Figure 15 shows.
5. Technological advances that reduce the cost of producing computer chips represent a decline in an input price for producing a computer. The result is a shift to the right in the supply of computers, as shown in Figure 19. The equilibrium price falls and the equilibrium quantity rises, as the figure shows.
Because computer software is a complement to computers, the lower equilibrium price of computers increases the demand for software. As Figure 20 shows, the result is a rise in both the equilibrium price and quantity of software.

![Figure 20](image)

Because typewriters are substitutes for computers, the lower equilibrium price of computers reduces the demand for typewriters. As Figure 21 shows, the result is a decline in both the equilibrium price and quantity of typewriters.

![Figure 21](image)

6. The statement that "an increase in the demand for notebooks raises the quantity of notebooks demanded, but not the quantity supplied," in general, is false. As Figure 10 shows, the increase in demand for notebooks results in an increased quantity supplied. The only way the statement would be true is if the supply curve was a vertical line, as shown in Figure 11.
7. a. DVDs and TV screens are likely to be complements because you cannot watch a DVD without a television. DVDs and movie tickets are likely to be substitutes because a movie can be watched at a theater or at home. TV screens and movie tickets are likely to be substitutes for the same reason.
b. The technological improvement would reduce the cost of producing a TV screen, shifting the supply curve to the right. The demand curve would not be affected. The result is that the equilibrium price will fall, while the equilibrium quantity will rise. This is shown in Figure 16.

![Figure 16](image)

Figure 16

c. The reduction in the price of TV screens would lead to an increase in the demand for DVDs because TV screens and DVDs are complements. The effect of this increase in the demand for DVDs is an increase in both the equilibrium price and quantity, as shown in Figure 17.

![Figure 17](image)

Figure 17
d. The reduction in the price of TV screens would cause a decline in the demand for movie tickets because TV screens and movie tickets are substitute goods. The decline in the demand for movie tickets would lead to a decline in the equilibrium price and quantity sold. This is shown in Figure 18.

![Figure 18](image)

b. People often travel to the Caribbean from New England to escape cold weather, so the demand for Caribbean hotel rooms is high in the winter. In the summer, fewer people travel to the Caribbean, because northern climes are more pleasant. The result, as shown in Figure 7, is a shift to the left in the demand curve. The equilibrium price of
Caribbean hotel rooms is thus lower in the summer than in the winter, as the figure shows.

![Diagram of market equilibrium]

Figure 7

When a war breaks out in the Middle East, many markets are affected. Because a large proportion of oil production takes place there, the war disrupts oil supplies, shifting the supply curve for gasoline to the left, as shown in Figure 8. The result is a rise in the equilibrium price of gasoline. With a higher price for gasoline, the cost of operating a gas-guzzling automobile like a Cadillac will increase. As a result, the demand for used Cadillacs will decline, as people in the market for cars will not find Cadillacs as attractive. In addition, some people who already own Cadillacs will try to sell them. The result is that the demand curve for used Cadillacs shifts to the left, while the supply curve shifts to the right, as shown in Figure 9. The result is a decline in the equilibrium price of used Cadillacs.

![Diagram of market equilibrium]

Figure 8  Figure 9

9. A temporarily high birth rate in the year 2010 leads to opposite effects on the price of babysitting services in the years 2015 and 2025. In the year 2015, there are more five-year olds
who need sitters, so the demand for baby-sitting services rises, as shown in Figure 28. The result is a higher price for baby-sitting services in 2015. However, in the year 2025, the increased number of 15-year-olds shifts the supply of baby-sitting services to the right, as shown in Figure 29. The result is a decline in the price of baby-sitting services.

10. Ketchup is a complement for hot dogs. Therefore, when the price of hot dogs rises, the quantity demanded of hot dogs falls and this lowers the demand for ketchup. The end result is that both the equilibrium price and quantity of ketchup fall. Because the quantity of ketchup falls, the demand for tomatoes by ketchup producers falls, so the equilibrium price and quantity of tomatoes fall. When the price of tomatoes falls, producers of tomato juice face lower input prices, so the supply curve for tomato juice shifts out, causing the price of tomato juice to fall and the quantity of tomato juice to rise. The fall in the price of tomato juice causes people to substitute tomato juice for orange juice, so the demand for orange juice declines, causing the price and quantity of orange juice to fall. Now you can see clearly why a rise in the price of hot dogs leads to a fall in the price of orange juice!

11. Quantity supplied equals quantity demanded at a price of $6 and quantity of 81 pizzas (Figure 30). If the price were greater than $6, quantity supplied would exceed quantity demanded, so suppliers would reduce the price to gain sales. If the price were less than $6, quantity demanded would exceed quantity supplied, so suppliers could raise the price without losing sales. In both cases, the price would continue to adjust until it reached $6, the only price at which there is neither a surplus nor a shortage.
12. The news of the increased health benefits from consuming oranges will increase the demand for oranges, increasing both the equilibrium price and quantity. If farmers use a new fertilizer that makes orange trees more productive, the supply of oranges will increase, leading to a fall in the equilibrium price but a rise in the equilibrium quantity. If both occur at the same time, the equilibrium quantity will definitely rise, but the effect on equilibrium price will be ambiguous.

13. a. Because flour is an ingredient in bagels, a decline in the price of flour would shift the supply curve for bagels to the right. The result, shown in Figure 31, would be a fall in the price of bagels and a rise in the equilibrium quantity of bagels.
Because cream cheese is a complement to bagels, the fall in the equilibrium price of bagels increases the demand for cream cheese, as shown in Figure 32. The result is a rise in both the equilibrium price and quantity of cream cheese. So, a fall in the price of flour indeed raises both the equilibrium price of cream cheese and the equilibrium quantity of bagels.

![Figure 32](image)

What happens if the price of milk falls? Because milk is an ingredient in cream cheese, the fall in the price of milk leads to an increase in the supply of cream cheese. This leads to a decrease in the price of cream cheese (Figure 33), rather than a rise in the price of cream cheese. So a fall in the price of milk could not have been responsible for the pattern observed.

![Figure 33](image)
b. In part (a), we found that a fall in the price of flour led to a rise in the price of cream cheese and a rise in the equilibrium quantity of bagels. If the price of flour rose, the opposite would be true; it would lead to a fall in the price of cream cheese and a fall in the equilibrium quantity of bagels. Because the question says the equilibrium price of cream cheese has risen, it could not have been caused by a rise in the price of flour.

What happens if the price of milk rises? From part (a), we found that a fall in the price of milk caused a decline in the price of cream cheese, so a rise in the price of milk would cause a rise in the price of cream cheese. Because bagels and cream cheese are complements, the rise in the price of cream cheese would reduce the demand for bagels, as Figure 34 shows. The result is a decline in the equilibrium quantity of bagels. So a rise in the price of milk does cause both a rise in the price of cream cheese and a decline in the equilibrium quantity of bagels.

![Figure 34](image)

14. a. As Figure 35 shows, the supply curve is vertical. The constant quantity supplied makes sense because the basketball arena has a fixed number of seats at any price.

b. Quantity supplied equals quantity demanded at a price of $8. The equilibrium quantity is 8,000 tickets.

c.

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity Demanded</th>
<th>Quantity Supplied</th>
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<tbody>
<tr>
<td>$4</td>
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<td>$8</td>
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<td>8,000</td>
</tr>
<tr>
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<td>8,000</td>
<td>8,000</td>
</tr>
<tr>
<td>$16</td>
<td>5,000</td>
<td>8,000</td>
</tr>
<tr>
<td>$20</td>
<td>2,000</td>
<td>8,000</td>
</tr>
</tbody>
</table>

The new equilibrium price will be $12, which equates quantity demanded to quantity supplied. The equilibrium quantity remains 8,000 tickets.
15. Equilibrium occurs where quantity demanded is equal to quantity supplied. Thus:

\[ Q' = Q' \]
\[ 1,600 - 300P = 1,400 + 700P \]
\[ 200 = 1,000P \]
\[ P = $0.20 \]

\[ Q' = 1,600 - 300(0.20) = 1,600 - 60 = 1,540 \]
\[ Q'' = 1,400 + 700(0.20) = 1,400 + 140 = 1,540. \]

The equilibrium price of a chocolate bar is $0.20 and the equilibrium quantity is 1,540 bars.

Chapter 5

Problems and Applications

1. a. If Maria always spends one-third of her income on clothing, then her income elasticity of demand is one, because maintaining her clothing expenditures as a constant fraction of her income means the percentage change in her quantity of clothing must equal her percentage change in income.

b. Maria's price elasticity of clothing demand is also one, because every percentage point increase in the price of clothing would lead her to reduce her quantity purchased by the same percentage.

c. Because Maria spends a smaller proportion of her income on clothing, then for any given price, her quantity demanded will be lower. Thus, her demand curve has shifted to the left. Because she will again spend a constant fraction of her income on clothing, her

2. If quantity demanded fell, price must have risen. If total revenue rose, then the percentage increase in the price must be greater than the percentage decline in quantity demanded. Therefore, demand is inelastic.

3. Yes, an increase in income would decrease the demand for good X because the income elasticity is less than zero, indicating that good X is an inferior good. A decrease in the price of good Y will decrease the demand for good X because the two goods are substitutes (as indicated by a cross-price elasticity that is greater than zero). Income and price elasticities of demand remain one.

4. a. The percentage change in price is equal to \((2.00 - 1.00)/2.00 = 0.2 = 20\%\). If the price elasticity of demand is 0.2, quantity demanded will fall by 4% in the short run \([0.20 \times 0.20]\). If the price elasticity of demand is 0.7, quantity demanded will fall by 14% in the long run \([0.7 \times 0.2]\).

b. Over time, consumers can make adjustments to their homes by purchasing alternative heat sources such as natural gas or electric furnaces. Thus, they can respond more easily to the change in the price of heating oil in the long run than in the short run.

5. a. If your income is $10,000, your price elasticity of demand as the price of compact discs rises from $8 to $10 is \([(40 - 32)/36]/[(10 - 8)/9] = 0.22/0.22 = 1\). If your income is $12,000, the elasticity is \([(50 - 45)/47.5]/[(10 - 8)/9] = 0.11/0.22 = 0.5\).

b. If the price is $12, your income elasticity of demand as your income increases from $10,000 to $12,000 is \([(30 - 24)/27]/[(12,000 - 10,000)/11,000] = 0.22/0.18 = 1.22\). If the price is $16, your income elasticity of demand as your income increases from $10,000 to $12,000 is \([(12 - 8)/10]/[(12,000 - 10,000)/11,000] = 0.40/0.18 = 2.2\).
6. a. For business travelers, the price elasticity of demand when the price of tickets rises from $200 to $250 is \[[(2,000 - 1,900)/(1,950)/(250 - 200)/225] = 0.05/0.22 = 0.23.\] For vacationers, the price elasticity of demand when the price of tickets rises from $200 to $250 is \[[(800 - 600)/700] / [(250 - 200)/225] = 0.29/0.22 = 1.32.\]

b. The price elasticity of demand for vacationers is higher than the elasticity for business travelers because vacationers can choose more easily a different mode of transportation (like driving or taking the train). Business travelers are less likely to do so because time is more important to them and their schedules are less adaptable.

7. Both Billy and Valerie may be correct. If demand increases, but supply is "totally" inelastic, equilibrium price will rise but the equilibrium quantity will remain the same. This would also occur if supply decreases and demand is "totally" inelastic. Marian is incorrect. If supply and demand both rise, equilibrium quantity will increase, but the impact on equilibrium price is indeterminate.

8. a. Mystery novels have more elastic demand than required textbooks, because mystery novels have close substitutes and are a luxury good, while required textbooks are a necessity with no close substitutes. If the price of mystery novels were to rise, readers could substitute other types of novels, or buy fewer novels altogether. But if the price of required textbooks were to rise, students would have little choice but to pay the higher price. Thus, the quantity demanded of required textbooks is less responsive to price than the quantity demanded of mystery novels.

b. Beethoven recordings have more elastic demand than classical music recordings in general. Beethoven recordings are a narrower market than classical music recordings, so it is easy to find close substitutes for them. If the price of Beethoven recordings were to rise, people could substitute other classical recordings, like Mozart. But if the price of all classical recordings were to rise, substitution would be more difficult. (A transition from classical music to rap is unlikely!) Thus, the quantity demanded of classical recordings is less responsive to price than the quantity demanded of Beethoven recordings.

c. Subway rides during the next five years have more elastic demand than subway rides during the next six months. Goods have a more elastic demand over longer time horizons. If the fare for a subway ride was to rise temporarily, consumers could not switch to other forms of transportation without great expense or great inconvenience. But if the fare for a subway ride was to remain high for a long time, people would gradually switch to alternative forms of transportation. As a result, the quantity demanded of subway rides during the next six months will be less responsive to changes in the price than the quantity demanded of subway rides during the next five years.

d. Root beer has more elastic demand than water. Root beer is a luxury with close substitutes, while water is a necessity with no close substitutes. If the price of water were to rise, consumers have little choice but to pay the higher price. But if the price of root beer were to rise, consumers could easily switch to other sodas. So the quantity demanded of root beer is more responsive to changes in price than the quantity demanded of water.

9. a. If quantity demanded falls by 4.3% when price rises by 20%, the price elasticity of demand is \[4.3/20 = 0.215,\] which is fairly inelastic.

b. Because the demand is inelastic, the Transit Authority’s revenue rises when the fare rises.

c. The elasticity estimate might be unreliable because it is only the first month after the fare increase. As time goes by, people may switch to other means of transportation in response to the price increase. So the elasticity may be larger in the long run than it is in the short run.
10. Tom's price elasticity of demand is zero, because he wants the same quantity regardless of the price. Jerry's price elasticity of demand is one, because he spends the same amount on gas, no matter what the price, which means his percentage change in quantity is equal to the percentage change in price.

11. a. With a price elasticity of demand of 0.4, reducing the quantity demanded of cigarettes by 20% requires a 50% increase in price, because 20/50 = 0.4. With the price of cigarettes currently $2, this would require an increase in the price to $3.33 a pack using the midpoint method (note that ($3.33 - $2)/$2.67 = .50).

b. The policy will have a larger effect five years from now than it does one year from now. The elasticity is larger in the long run, because it may take some time for people to reduce their cigarette usage. The habit of smoking is hard to break in the short run.

c. Because teenagers do not have as much income as adults, they are likely to have a higher price elasticity of demand. Also, adults are more likely to be addicted to cigarettes, making it more difficult to reduce their quantity demanded in response to a higher price.

12. In order to determine whether you should raise or lower the price of admissions, you need to know if the demand is elastic or inelastic. If demand is elastic, a decline in the price of admissions will increase total revenue. If demand is inelastic, an increase in the price of admissions will cause total revenue to rise.

13. a. As Figure 2 shows, the increase in supply reduces the equilibrium price and increases the equilibrium quantity in both markets.

b. In the market for pharmaceutical drugs (with inelastic demand), the increase in supply leads to a relatively large decline in the equilibrium price and a small increase in the equilibrium quantity.

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**Figure 2**

[Image of graphs showing supply and demand curves for pharmaceutical drugs and computers]
c. In the market for computers (with elastic demand), the increase in supply leads to a relatively large increase in the equilibrium quantity and a small decline in the equilibrium price.

d. Because demand is inelastic in the market for pharmaceutical drugs, the percentage increase in quantity will be lower than the percentage decrease in price; thus, total consumer spending will decline. Because demand is elastic in the market for computers, the percentage increase in quantity will be greater than the percentage decrease in price, so total consumer spending will increase.

14. a. As Figure 3 shows, the increase in demand increases both the equilibrium price and the equilibrium quantity in both markets.

b. In the market for beachfront resorts (with inelastic supply), the increase in demand leads to a relatively large increase in the equilibrium price and a small increase in the equilibrium quantity.

c. In the market for automobiles (with elastic supply), the increase in demand leads to a relatively large increase in the equilibrium quantity and a small increase in equilibrium price.

d. In both markets, total consumer spending rises, because both equilibrium price and equilibrium quantity rise.

![Diagram of Beachfront Resorts and Automobiles](image)

**Figure 3**

15. a. Farmers whose crops were not destroyed benefited because the destruction of some of the crops reduced the supply, causing the equilibrium price to rise.

b. To tell whether farmers as a group were hurt or helped by the floods, you would need to know the price elasticity of demand. It could be that the total revenue received by all farmers as a group actually rose.

16. A worldwide drought could increase the total revenue of farmers if the price elasticity of demand for grain is inelastic. The drought reduces the supply of grain, but if demand is inelastic, the reduction of supply causes a large increase in price. Total farm revenue would rise as a result. If there is only a drought in Kansas, Kansas' production is not a large enough proportion of the total farm product to have much impact on the price. As a result, price does not change (or changes by only a slight amount), while the output by Kansas farmers declines, thus reducing their income.
17. The quantity demanded at various prices is shown in the table below:

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity Demanded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>30</td>
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</tr>
<tr>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

The demand curve is shown in Figure 4. When price rises from $1 to $2 (a 66.67% increase), quantity demanded falls from 60 to 30 (a 66.67% decrease). Therefore, the price elasticity of demand is equal to one. When price rises from $5 to $6 (an 18.18% increase), quantity demanded falls from 12 to 10 (an 18.18% decline). Again the price elasticity is equal to one. A linear demand curve has a price elasticity that declines in absolute value as price falls. This demand curve has a constant elasticity equal to one.

Chapter 6

Problems and Applications

1. a. Figure 9 shows the effects of the minimum wage. In the absence of the minimum wage, the market wage would be $w_2$ and $Q_2$ workers would be employed. With the minimum wage ($w_m$) imposed above $w_2$, the market wage is $w_m$, the number of employed workers is $Q_1$, and the number of workers who are unemployed is $Q_2 - Q_1$. Total wage payments to workers are shown as the area of rectangle $ABCD$, which equals $w_m$ times $Q_1$. 
b. An increase in the minimum wage would decrease employment. The size of the effect on employment depends only on the elasticity of demand. The elasticity of supply does not matter, because there is a surplus of labor.

c. The increase in the minimum wage would increase unemployment. The size of the rise in unemployment depends on both the elasticities of supply and demand. The elasticity of demand determines the change in the quantity of labor demanded, the elasticity of supply determines the change in the quantity of labor supplied, and the difference between the quantities supplied and demanded of labor is the amount of unemployment.

d. If the demand for unskilled labor were inelastic, the rise in the minimum wage would increase total wage payments to unskilled labor. With inelastic demand, the percentage decline in employment would be lower than the percentage increase in the wage, so total wage payments increase. However, if the demand for unskilled labor were elastic, total wage payments would decline, because then the percentage decline in employment would exceed the percentage increase in the wage.

2. a. Figure 5 shows the market for beer without the tax. The equilibrium price is $P_1$ and the equilibrium quantity is $Q_1$. The price paid by consumers is the same as the price received by producers.
b. When the tax is imposed, it drives a wedge of $2 between supply and demand, as shown in Figure 6. The price paid by consumers is \( P_2 \), while the price received by producers is \( P_1 - 2 \). The quantity of beer sold declines to \( Q_1 \).

3. a. It does not matter whether the tax is imposed on producers or consumers—the effect will be the same. With no tax, as shown in Figure 7, the demand curve is \( D_1 \) and the supply curve is \( S_1 \). If the tax is imposed on producers, the supply curve shifts up by the amount of the tax (50 cents) to \( S_2 \). Then the equilibrium quantity is \( Q_2 \), the price paid by consumers is \( P_2 \), and the price received (after taxes are paid) by producers is \( P_1 \) - 50 cents. If the tax is instead imposed on consumers, the demand curve shifts down by the amount of the tax (50 cents) to \( D_2 \). The downward shift in the demand curve when the tax is imposed on consumers is exactly the same magnitude as the upward shift in the supply curve when the tax is imposed on producers. So again, the equilibrium quantity is \( Q_2 \), the price paid by consumers is \( P_2 \) (including the tax paid to the government), and the price received by producers is \( P_1 + 50 \) cents.
b. The more elastic the demand curve is, the more effective this tax will be in reducing the quantity of gasoline consumed. Greater elasticity of demand means that quantity falls more in response to the rise in the price of gasoline. Figure 8 illustrates this result. Demand curve $D_1$ represents an elastic demand curve, while demand curve $D_2$ is more inelastic. The tax will cause a greater decline in the quantity sold when demand is elastic.

![Graph showing price and quantity of gasoline](image)

**Figure 8**

c. The consumers of gasoline are hurt by the tax because they get less gasoline at a higher price.

d. Workers in the oil industry are hurt by the tax as well. With a lower quantity of gasoline being produced, some workers may lose their jobs. With a lower price received by producers, wages of workers might decline.

4. a. The equilibrium price of Frisbees is $8 and the equilibrium quantity is six million Frisbees.

   b. With a price floor of $10, the new market price is $10 because the price floor is binding. At that price, only two million Frisbees are sold, because that is the quantity demanded.

   c. If there's a price ceiling of $9, it has no effect, because the market equilibrium price is $8, which is below the ceiling. So the market price is $8 and the quantity sold is six million Frisbees.

5. If the government imposes a $500 tax on luxury cars, the price paid by consumers will rise less than $500, in general. The burden of any tax is shared by both producers and consumers—the price paid by consumers rises and the price received by producers falls, with the difference between the two equal to the amount of the tax. The only exceptions would be if the supply curve were perfectly elastic or the demand curve were perfectly inelastic, in which case consumers would bear the full burden of the tax and the price paid by consumers would rise by exactly $500.

6. a. The imposition of a binding price floor in the cheese market is shown in Figure 4. In the absence of the price floor, the price would be $P_1$, and the quantity would be $Q_1$. With the floor set at $P_1$, which is greater than $P_2$, the quantity demanded is $Q_2$, while quantity supplied is $Q_3$, so there is a surplus of cheese in the amount $Q_3 - Q_2$.

   b. The farmers’ complaint that their total revenue has declined is correct if demand is elastic. With elastic demand, the percentage decline in quantity would exceed the percentage rise in price, so total revenue would decline.

   c. If the government purchases all the surplus cheese at the price floor, producers benefit and taxpayers lose. Producers would produce quantity $Q_4$ of cheese, and their total revenue would increase substantially. However, consumers would buy only quantity $Q_5$ of cheese, so they are in the same position as before. Taxpayers lose because they would be financing the purchase of the surplus cheese through higher taxes.
7. Reducing the payroll tax paid by firms and using part of the extra revenue to reduce the payroll tax paid by workers would not make workers better off, because the division of the burden of a tax depends on the elasticity of supply and demand and not on who must pay the tax. Because the tax wedge would be larger, it is likely that both firms and workers, who share the burden of any tax, would be worse off.

8. If the price ceiling of $40 per ticket is below the equilibrium price, then quantity demanded exceeds quantity supplied, so there will be a shortage of tickets. The policy decreases the number of people who attend classical music concerts, because the quantity supplied is lower because of the lower price.

9. a. Figure 10 shows the effect of a tax on gun buyers. The tax reduces the demand for guns from $D_1$ to $D_2$. The result is a rise in the price buyers pay for guns from $P_1$ to $P_2$, and a decline in the quantity of guns from $Q_1$ to $Q_2$. 
b. Figure 11 shows the effect of a tax on gun sellers. The tax reduces the supply of guns from $S_1$ to $S_2$. The result is a rise in the price buyers pay for guns from $P_1$ to $P_2$, and a decline in the quantity of guns from $Q_1$ to $Q_2$.

c. Figure 12 shows the effect of a binding price floor on guns. The increase in price from $P_1$ to $P_2$ leads to a decline in the quantity of guns from $Q_1$ to $Q_2$. There is excess supply in the market for guns, because the quantity supplied ($Q_S$) exceeds the quantity demanded ($Q_D$) at the price $P_2$. 

Figure 10

Figure 11

Figure 12
d. Figure 13 shows the effect of a tax on ammunition. The tax on ammunition reduces the demand for guns from $D_1$ to $D_2$ because ammunition and guns are complements. The result is a decline in the price of guns from $P_1$ to $P_2$, and a decline in the quantity of guns from $Q_1$ to $Q_2$.

10. The language of the proposed legislation suggests that the governor wanted to place the entire burden of the tax on employers. This would not have been possible, as employers and employees would have likely shared the burden of the tax.

11. a. Programs aimed at making the public aware of the dangers of smoking reduce the demand for cigarettes, shown in Figure 14 as a shift from demand curve $D_1$ to $D_2$. The price support program increases the price of tobacco, which is the main ingredient in cigarettes. As a result, the supply of cigarettes shifts to the left, from $S_1$ to $S_2$. The effect of both programs is to reduce the quantity of cigarette consumption from $Q_1$ to $Q_3$. 
b. The combined effect of the two programs on the price of cigarettes is ambiguous. The education campaign reduces demand for cigarettes, which tends to reduce the price. The tobacco price supports raising the cost of production of cigarettes, which tends to increase the price.

c. The taxation of cigarettes further reduces cigarette consumption, because it increases the price to consumers. As shown in the figure, the quantity falls to $Q_3$.

12. Since the supply of seats is perfectly inelastic, the entire burden of the tax will fall on the team’s owners. Figure 15 shows that the price the buyers pay for the tickets will fall by the exact amount of the tax.
13. a. The effect of a $0.50 per cone subsidy is to shift the demand curve up by $0.50 at each quantity, because at each quantity a consumer’s willingness to pay is $0.50 higher. The effects of such a subsidy are shown in Figure 16. Before the subsidy, the price is $P_1$. After the subsidy, the price received by sellers is $P_1$ and the effective price paid by consumers is $P_0$, which equals $P_1$ minus $0.50$. Before the subsidy, the quantity of cones sold is $Q_1$; after the subsidy the quantity increases to $Q_2$.

14. a. If gasoline refineries are operating at near full capacity, supply is likely to be highly inelastic.

b. The burden of a tax falls on the side of the market that is relatively more inelastic. Thus, it will be suppliers who will benefit from the temporary suspension of the federal gasoline tax.