Multiple Choice:

1. An uncompensated price change
a. requires compensation payments by the seller.
b. is not the same as the price changes we normally observe. That is why compensation is needed.
c. is the same as the price changes we normally observe. There is no addition or subtraction to income to ensure that the price change does not alter consumer utility.
d. requires compensation payments by the buyer.

2. The substitution effect of a price change
a. moves the consumer along one indifference curve.
b. is the same as the impact of a compensated price change.
c. both of the above
d. none of the above

3. The income effect involves:
a. no shift in the budget line.
b. rotation of the budget line.
c. a parallel shift in the budget line.
d. none of the above

4. For a normal good, the income and substitution effect work
a. in the same direction.
b. in opposite direction.
c. either a or b is possible

5. Application 6.1 states that the elasticity of demand for shochu 8.81. This implies that shochu
a. is an inferior good.
b. is a Giffen good.
c. is a normal good.
d. both a and b

6. Compensating variation is the amount of money that
a. exactly offsets the effect of a price change, and keeps the consumer on the same indifference curve.
b. measures the variation of income across individuals.
c. none of the above

7. Consumer surplus is
a. the area between the demand curve and the line that represents price – and between the quantity zero and the quantity purchased by the consumer.
b. the consumer's total net benefit.
c. both a and b

d. none of the above

8. Hausman estimated consumer surplus from cell phones
a. by estimating the demand curve and then computing the area between that demand curve and the price line.
b. and concluded that the federal regulation (that delayed the introduction of cell phones) helped consumers by increasing the magnitude of consumer surplus.
c. both a and b
d. none of the above

9. Real income
a. is the income that household really receive.
b. measures the inflation-adjusted income that households receive.
c. is the same as nominal income
d. none of the above

10. Lebow and Rudd concluded that the CPI
a. understates the annual rate of increase in the cost of living.
b. overstates the annual rate of increase in the cost of living.
c. provides an accurate measure of the rate of increase in the cost of living.
d. none of the above

Answers to Multiple Choice Quiz

1. c
2. c
3. c
4. a
5. d
6. a
7. c
8. a
9. b
10. b

Answers to Chapter 6 In-Text Questions

6.1 (BW p172)
From Worked-Out problem 5.6, we know that Keiko will choose 25 gallons of gasoline and 30 wireless minutes when the price of gasoline is $1 per gallon. When that price rises to $2.50 per gallon, we can find her optimal choice by setting her MRS_{GW} equal to the price ratio:

$$MRS_{GW} = \frac{P_G}{P_W}$$

$$\frac{10}{\sqrt{G}} = \frac{\$2.50}{\$0.50}$$
$$10 = 5\sqrt{G}$$
$$\boldsymbol{G = 4}$$

If she purchases four gallons of gasoline, that means she spends $10 on gasoline, leaving $30 to purchase wireless minutes. She must purchase 60 wireless minutes. So her original bundle was (25,30) and her new uncompensated bundle is (4,60).

To find the compensated bundle, we need to find a bundle that meets two criteria: (1) it is on the same indifference curve as her original bundle, and (2) the *MRS* at this bundle must equal the new price ratio.

Since the formula for her indifference curves is $W = U - 20\sqrt{G}$, her original bundle of (25, 30) must lie on an indifference curve with $U = 130$. So the equation representing that specific indifference curve is $W = 130 - 20\sqrt{G}$.

The *MRS* at the compensated bundle must be equal to the new price ratio. This equation was done above and resulted in the condition that $G = 4$. Therefore, we can plug this G into the indifference curve above and show that W for the compensated bundle is 90.

Therefore, the compensated price effect shifts Keiko from the bundle (25,30) to the bundle (4, 90). This is the substitution effect. (The income effect is the residual, the shift from this compensated bundle to the final bundle.) To determine the amount of compensation, we must figure out how much this compensated bundle would cost at the new prices, which is easy: $2.50(4) + $0.50(90) = $55. Since Keiko's income is only $40, the compensation must be $15.

6.2 (BW178)
From the information provided in Worked-Out Question 6.2, we know that Keiko wants to buy 25 gallons of gasoline and use 200 wireless minutes. We further know that the equation for the indifference curve through this bundle is $W = 300 - 20\sqrt{G}$. Her phone can only be used for 100 minutes per month, so in order to remain on the same indifference curve, she would have to purchase gasoline such that $100 = 300 - 20\sqrt{G}$. This works out to show that $G = 100$. The compensated bundle is (100,100). This bundle would cost Keiko $1.00(100) + $0.50(100), or $150. Since Keiko's budget is only $125, it would take $25 to compensate her for the malfunction.

6.3 (BW p.182)
If Abigail's demand curve for minutes of wireless telephone service is $W = 300 - 200P_W$, then her demand curve intersects the price axis at a price of $1.50. (This is the lowest price at which she would demand exactly zero minutes of wireless telephone service; it can be found by plugging 0 in for W.) If the price is $1, this means that the height of the triangle that shows her consumer surplus is $0.50. To figure out the width of the triangle,

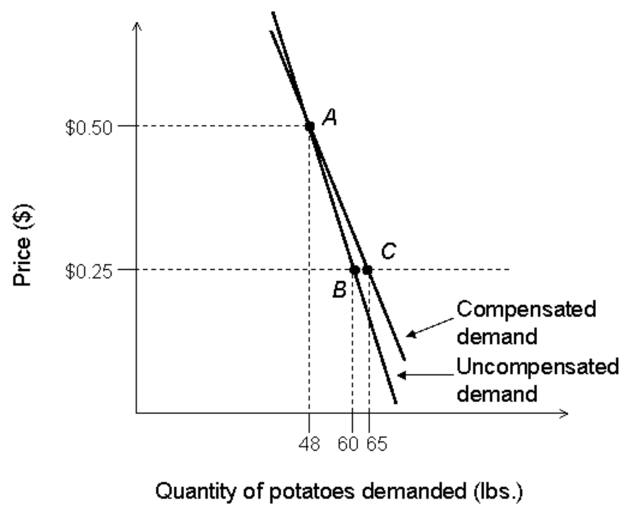
we only need to know how many wireless minutes Abigail demands at the new price of \$1.00, which is just W = 300 – 200(1.00), or 100.

So the area of this triangle is ½(\$0.50)(100) = \$25. This represents a decrease in consumer surplus for Abigail of \$75, since we know from Worked-Out Problem 6.3 that her original consumer surplus (at a price of \$0.50) was \$100.

6.4 (BW p.198)
Since points *A* and *B* represent Erin's original choice and choice after the price change, respectively, they are both points that belong on her uncompensated demand curve. This is because both points *A* and *B* cost Erin \$36 (her total income) at their respective price levels.

Points *A* and *C* both belong on her compensated demand curve, because points *A* and *C*, though they vary in the amount they would cost Erin, each provide Erin with the same level of utility.

The graphs are to the right. The compensated demand curve is flatter than the uncompensated demand curve because potatoes are an inferior good.



6.5 (BW p.198)
First we will solve for Keiko's compensated demand curve for wireless minutes. Any bundle that lies on a compensated demand curve must satisfy two conditions: (1) it must provide the same amount of utility as the current bundle, and (2) it must satisfy the tangency condition.

From Worked-Out Question 6.2, we know that Keiko's current bundle is (25, 200). Solving the indifference curve $W = U - 20\sqrt{G}$ for U by plugging in 25 and 200 shows that U = 300 and the indifference curve must be $W = 300 - 20\sqrt{G}$.

The tangency condition requires that the *MRS* be equal to any price ratio. Plugging in P_G but leaving P_W variable yields:

$$MRS_{GW} = \frac{P_G}{P_W}$$

$$\frac{10}{\sqrt{G}} = \frac{1.00}{P_W}$$

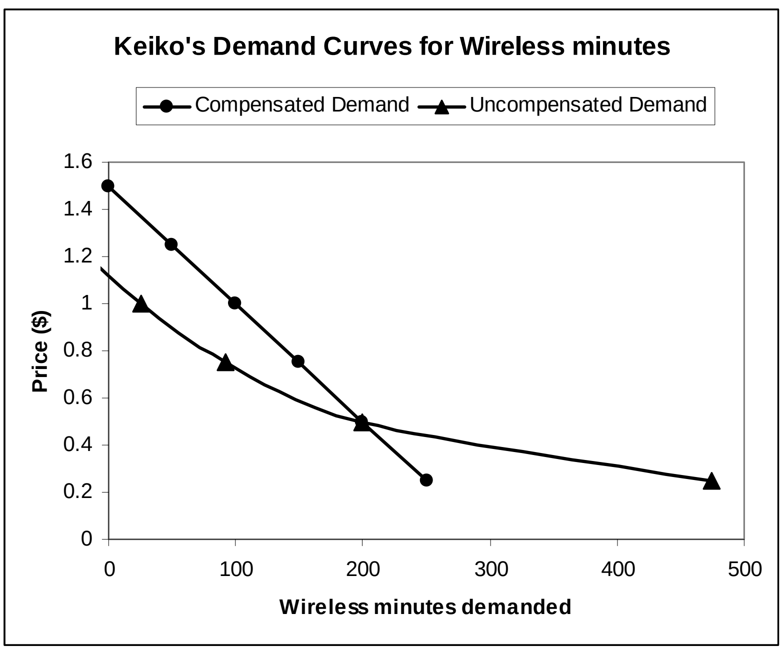
$\sqrt{G} = 10P_W$

Since G shows up in the indifference curve under a radical, we can leave it like this, and plug it into the indifference curve and we get $W = 300 - 200P_W$. This is the formula for the compensated demand curve for wireless minutes. The uncompensated demand curve must satisfy the tangency condition and the budget constraint of $125, so we can simply plug $G = 100P_W^2$ (from above) into the budget constraint:

$M = P_G G + P_W W$
$125 = (1.00)(100P_W^2) + \underline{P_W W}$
$W = \dfrac{125}{P_W} - 100P_W$

This is the formula for the uncompensated demand curve. A table will be helpful for coming up with points to use to construct these curves. It is easiest to use Excel to create these graphs.

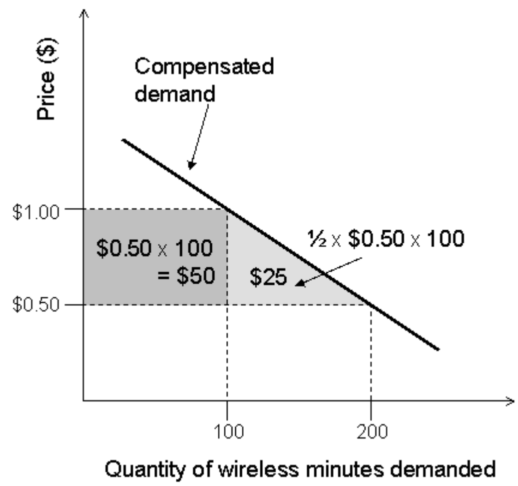
P_W	Compensated W	Uncompensated W
$0.25	250	475
0.50	*200*	*200*
0.75	150	91.67
1.00	100	25
1.25	50	–25
1.50	0	–66.67



Keiko’s uncompensated demand curve for wireless minutes is flatter than her compensated demand curve, which means that wireless minutes are a normal good.

Regarding her compensated and uncompensated demand curves for gasoline, we saw before, in Worked-Out Problem 5.6 on page 156, that at any income higher than $25, Keiko’s demand for gasoline is income inelastic. This means that there is no income effect from a price change on quantity demanded, only a substitution effect. Therefore, the uncompensated demand curve, which shows both income and substitution effects, and the compensated demand curve, which shows just substitution effects, would be the same.

6.6 (BW p.202)
Keiko's compensated demand curve for wireless minutes is given by $W = 300 - 200P_W$, as calculated above. When the price rises from $0.50 per minute to $1.00 per minute, her compensated demand for wireless minutes decreases from 200 to 100. We can calculate the compensating variation as the change in consumer surplus resulting from this price increase, using the compensated demand curve.



The choke price of the compensated demand curve (where $W = 0$) is $1.50. Therefore, we can calculate consumer surplus at each price:

CS at $0.50 = ½($1.50 - $0.50)(200) = $100
CS at $1.00 = ½($1.50 - $100)(100) = $25

The difference here is $75, which is the compensating variation. This can also be shown on the graph to the right, as the sum of the two shaded areas.

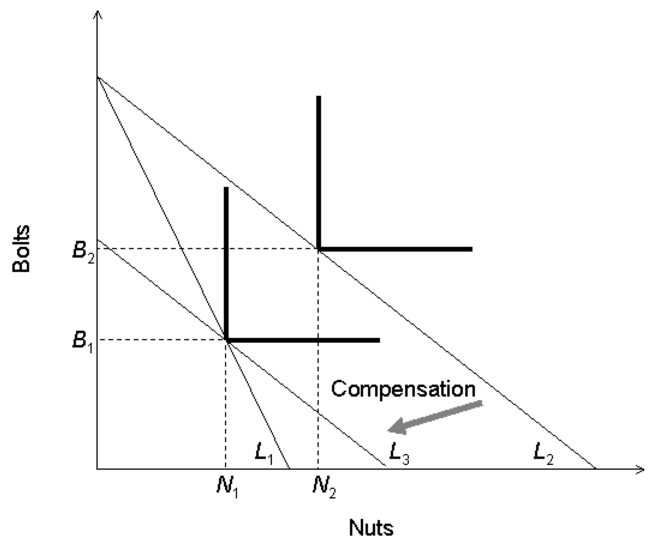
6.7 (BW p.207)
This is a straight-forward application of the Slutsky Equation. In this problem, we are given the share of his income that Rico spends on CDs, the uncompensated price elasticity of his demand for CDs and the income elasticity of his demand for CDs. We can just plug these numbers in and solve for the compensated price elasticity.

$$E_P^{Comp} = E_P^{Uncomp} + S \times E_Y$$
$$E_P^{Comp} = (-1.5) + (.03 \times 2)$$
$$E_P^{Comp} = (-1.5) + (.06)$$
$$\boldsymbol{E_P^{Comp} = -0.9}$$

The compensated demand curve has a lower elasticity (is steeper) than the uncompensated demand curve. This means that CDs are a normal good.

Answers to End-of-Chapter 6 Questions

6.1



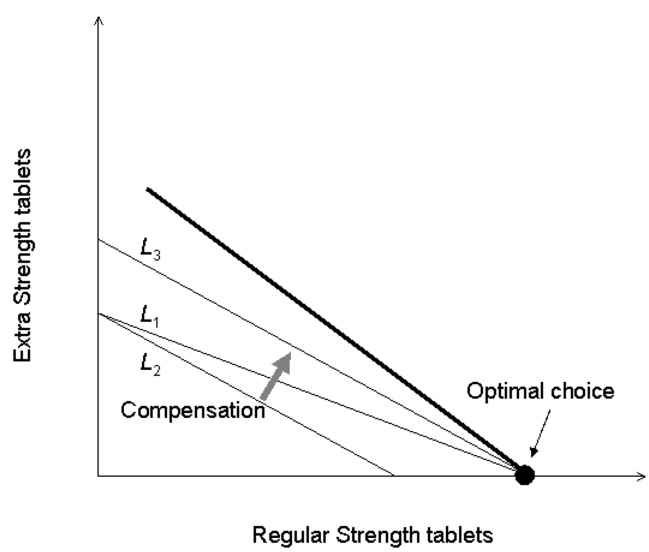
Since Ted believes nuts and bolts to be perfect complements, the tangency condition that is normal used for utility-maximization never applies. Rather, Ted always chooses a bundle where the number of bolts and number of nuts are equal, at the corner of his right-angle indifference curves.

If the price of nuts were to decrease, Ted's budget line would shift out from L_1 to L_2. If uncompensated, Ted would be able to purchase more nuts (and more bolts), B_2 and N_2. However, if we wanted to compensate Ted for the price change, we would have to take away income to return his previous level of happiness. Well, regardless of the new price ratio (slope of L_2 and L_3), his old consumption bundle (B_1 bolts and N_1 nuts) is *still* the least expensive bundle that provides the original level of happiness. In other words, to fully compensate Ted, he must have enough income taken away such that he purchases the same number of nuts and bolts as before. His bundle would not change at all.

Typically, the bundle on the original indifference curve but on budget constraint L_3 would be a bundle that shows the substitution effect only. In this case, however, there is *no* difference between this bundle and the original bundle, suggesting that there is no substitution effect at work. This makes sense given Ted's preferences over nuts and bolts: they are perfect 1:1 complements. Ted can never substitute a nut for a bolt or vice versa.

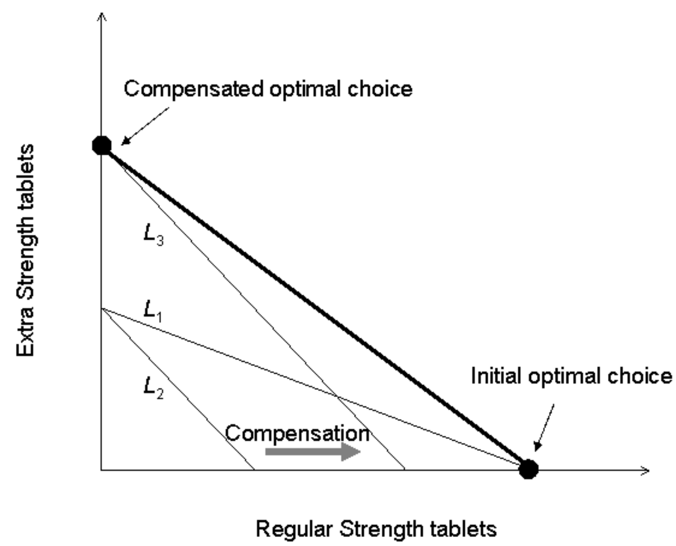
6.2

If two regular-strength tablets are equivalent to one extra-strength tablet, then the consumer will always spend his or her entire pain killer budget on regular-strength tablets if they are less than half the price of extra-strength tablets. If regular-strength tablets are more than half of the price of extra-strength tablets, the consumer would purchase only extra strength tablets. The increases in the price of regular strength tablets are discussed below.

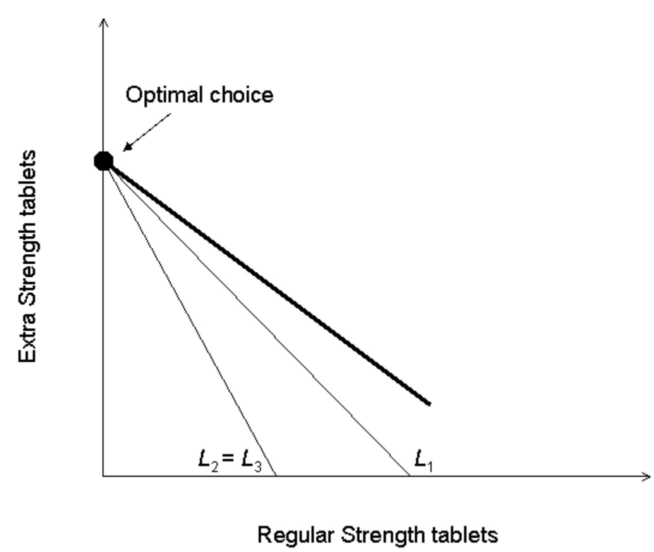


(a) If the final price of extra-strength tablets is more than twice the price of regular-strength tablets after the price of regular-strength tablets has increased, then this means that two regular-strength tablets were and are cheaper than extra-strength tablets. Therefore, the consumer would always have purchased zero extra-strength tablets and spent his or her entire pain killer budget on regular strength tablets. In this case, compensating for the price increase means giving the consumer enough additional income to purchase the same number of regular-strength tablets as before, since this consumer never purchases extra-strength tablets. In this case, there is no substitution effect; there is only an income effect.

(b) In this scenario, two regular-strength pain tablets were cheaper than one extra-strength pain tablet before the price change (so the consumer purchased only regular-strength), but this is no longer true after the price change. Now, one extra-strength tablet is cheaper than two regular-strength tablets, so this consumer purchases only extra-strength tablets. Since after the price change the consumer purchases only extra strength tablets, the compensation involves giving the consumer extra income to buy more extra-strength tablets, but does not have an impact on the demand for regular strength tablets. At the higher price for regular-strength tablets, compensated and uncompensated demand for regular-strength tablets would be the same: zero. With respect to regular-strength tablets, there is no income effect, only a pure substitution effect.

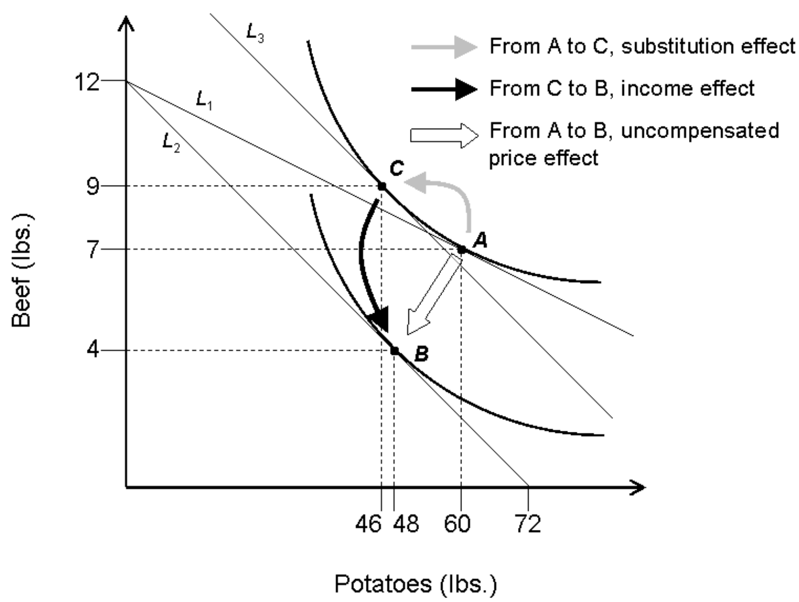


(c) In this case, the consumer always purchases only extra-strength tablets, so that the demand, whether compensated or uncompensated, for regular-strength tablets is always zero. When compensated, this change does not affect the consumer’s choice, because the new budget constraint is *also* the compensated budget constraint. There is no substitution or income effect here for regular-strength tablets.



With perfect substitutes, the size of the substitution effect depends on the current price level and whether the price change actually causes a substitution. In parts (a) and (c) there was no substitution effect because the consumer did not substitute away from one good in favor of the other good. In part (b) there was *only* a substitution effect for regular-strength tablets (the uncompensated change was from *some* regular-strength tablets to *none* and the compensated change was the same) because the consumer made a substitution.

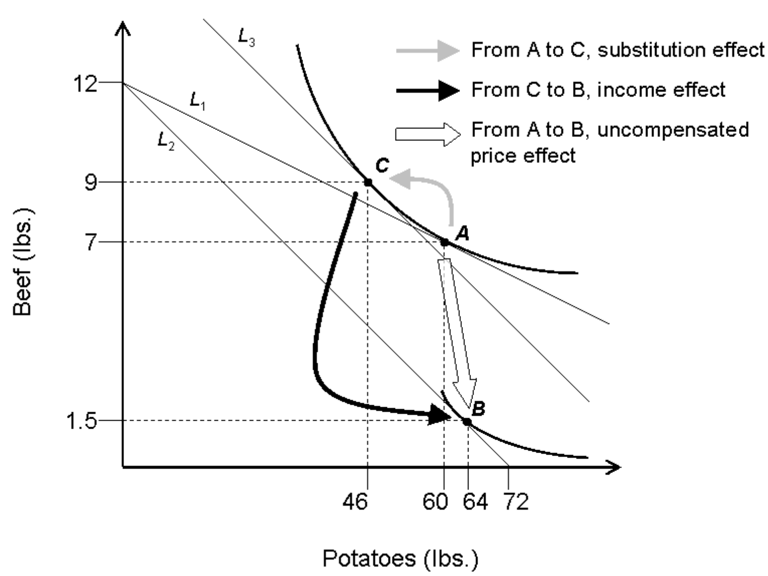
6.3



To check if a student's graph is correct, verify the following things: (1) the substitution effect should involve moving up and to the left (more beef and fewer potatoes), because potatoes are relatively more expensive than they used to be; (2) the income effect should involve a move down and to the right (more potatoes and less beef), because the higher price of potatoes means the consumer is poorer, and so should buy less of a normal good (beef) and more of an inferior good (potatoes); (3) the original budget constraint should be flatter than the other two, because the price of potatoes has risen, making the budget constraint steeper; (4) the intermediate point (*C* in this drawing) should lie on the same indifference curve as the initial point *A*, but on L_3, which is parallel to L_2; and (5) the uncompensated price effect may involve more or less beef and more or fewer potatoes, but definitely not more of both.

6.4

This drawing could look exactly like the drawing from 6.3 with one exception: the income effect (from *C* to *B*) must increase potato consumption out beyond its original level, so that the uncompensated affect necessarily involves more potatoes and less beef.



6.5
Not every good can be a Giffen good. For Giffen goods, an increase in price would cause a consumer to allocate more of his or her resources to the good. However, a consumer who tries to buy more of every good with the same amount of resources in the face of a rising price will find that this is impossible.

Suppose a consumer consumes two goods, one of which we are certain is a Giffen good. When the certain Giffen good's price rises, the consumer will buy more of it. As for the other good, the consumer must necessarily buy less of it (to make way for increased consumption of the Giffen good). However, the substitution effect for the other good tells the consumer to buy more of it (because it is relatively cheaper now). It must be that the income effect on this other good dominates and tells the consumer to buy less of it. If the income effect drives a consumer to buy less of a good due to a rising price, the good must be normal. Giffen goods are not normal. Therefore, not all goods can be Giffen.

6.6
(Student answers may vary.)

a. The benefit associated with the poetry reading from an economics professor is –$20 (cost of my time plus headache medicine), so the compensating variation is $20. (In other words, someone would have to pay me $20 to sit through this reading.

b. Meeting a favorite musician would be an unexpected benefit (say +$100), so I would be willing to pay up to that amount to meet him or her. The compensating variation in this case would be –$100.

c. The compensating for this would be positive, unless it meant missing work or some important social event. If I'm not missing anything, I might say this would be worth $200. Since I'd be willing to have income taken away from me to enjoy this benefit, the compensating variation is negative, –$200 in my case.

d. The largest benefit or cost associated with the change in major could be the relative kind of job (and salary) that is attainable with each major, plus any additional cost like added time, effort, money for tuition and supplies, and so on. Or it could simply involve tastes. I love economics, so majoring in anything else would impost a serious cost on me. I would have to be compensated greatly to be forced to learn another subject, maybe $10,000. So the compensating variation is $10,000.

6.7
If Sam is a utility maximizer, then he is spending all $30,000 of his income on goods that make him happy. If the government increased his income by 12%, it would increase to $33,600. If the prices increased by 8%, then his current consumption bundle would increase in cost to $32,400. At his previous level of consumption, Sam now has $1,200 leftover to spend on more goods and services. We could take this $1,200 from him and he

would remain just as happy as he was before. Therefore, the compensating variation for this income and price change is –$1,200.

6.8
While the compensating variation is a good measure of consumer surplus, it does not necessarily tell us which of two policies should be implemented. One thing that is missing from this analysis is the *cost* of implementing each policy. If one policy creates more consumer surplus, but does so at a cost which is higher than the increase in consumer surplus, it could actually reduce total welfare. Whereas a policy that increases consumer surplus by a little less but does so a lot more cheaply may be better.

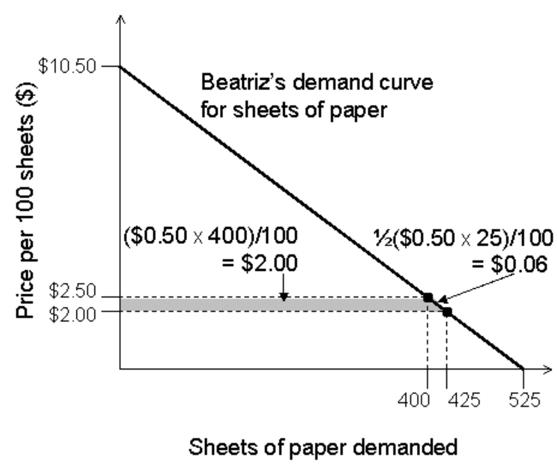
In order to compare the benefits of the policy to its costs, it might be better to look at a measure of consumer surplus from a point of view *before* the implementation of the policy. The "hint" describes this as the compensating variation of reversing the policy, but it can also be thought of as the *equivalent variation*, which tells us what change in income before the policy is *equivalent* to the policy. If we knew this number, as well as the cost of implementing the policy, we could be surer about whether the policy was a good idea. If policy *A* is equivalent to increasing someone's income $1,000 (or the compensating variation of reversing this policy is $1,000) but it costs $1,200 to implement, it would be better simply to give the individual the $1,000 rather than implement this wasteful policy.

6.9
If Albert's demand curve for music downloads is $M = 150 - 60P_M$, then the choke price (the lowest price at which he will demand zero downloads) is $2.50. (This will be needed to calculate the height of the *CS* triangle.) At a price of $1.00 per download, Albert demands 90 downloads; at a price of $2.00, he demands 30. Using this information, we can calculate his increase in consumer surplus as the price falls from $2.00 to $1.00:

Original *CS*: ½($2.50 - $2.00)(30) = $7.50
New *CS*: ½($2.50 - $1.00)(90) = $67.50

The increase in consumer surplus is $60.

6.10
(*Be careful*: P_S is the price for 100 sheets, but *S* is measured in sheets. In order to calculate *CS*, an adjustment has to be made. I make mine below by dividing the height of the consumer surplus triangle by 100.)



If Beatriz's demand curve for paper is $S = 525 - 50P_S$, then the choke price (the lowest price at which she will demand zero sheets) is $10.50 per 100 sheets. (This will be needed to calculate the height of the *CS* triangle.) At a price of $2.00 per 100 sheets, she currently purchases 425 sheets. At the new price of $2.50 per 100 sheets, she demands 400 sheets. Using this information, we can calculate his increase in consumer surplus as the price rises from $2.00 to $2.50:

Original *CS*: ½(($10.50 - $2.00)/100)(425) = $18.06
New *CS*: ½(($10.50 - $2.50)/100)(400) = $16.00
The decrease in her consumer surplus is $2.06.

The tax is equal to $0.50 per 100 sheets. After the tax, Beatriz purchases 400 taxed sheets, meaning that she pays 4($0.50), or $2.00 in taxes. This is slightly lower than the cost to her in terms of reduced consumer surplus. The government has not raised enough money to compensate her for her loss. If government could raise more money than it would take to compensate the losers from tax money, then government could continually make all people better off through increased taxes, essentially *creating* surplus out of thin air. This obviously doesn't work.

6.11
It helps to create a table like the one below, since all of this information is going to be needed for this problem.

	Cost of each bundle at prices from…		
	… June (P_S = \$1; P_L =\$1.30)	**… July (P_S = \$1.10; P_L = \$1.70)**	**… August (P_S = \$1.40; P_L = \$1.80)**
June bundle $S = 5; L = 20$	$31.00	$39.50	$43.00
July bundle $S = 7; L = 18$	$30.40	$38.30	$42.20
August bundle $S = 3; L = 23$	$32.90	$42.40	$45.60

a. Using June as the base month (referring to the first row of the above table), we calculate the Laspeyres price index by dividing each cell in that row by $31.00 (the cost of the base bundle in the base month). The price index for June is 1.000; the price index for July is 1.274; the price index for August is 1.387. According to this measure, Arnold's cost of living increased by 27.4% from June to July, 8.9% from July to August, and 38.7% from June to August.

b. Using July as the base month (referring to the second row of the above table), we calculate the Laspeyres price index by dividing each cell in that row by $38.30 (the cost of the base bundle in the base month). The price index for June is 0.794; the price index for July is 1.000; the price index for August is 1.102. According to this measure, Arnold's cost of living increased by 25.9% from June to July,10.2% from July to August, and 38.8% from June to August.

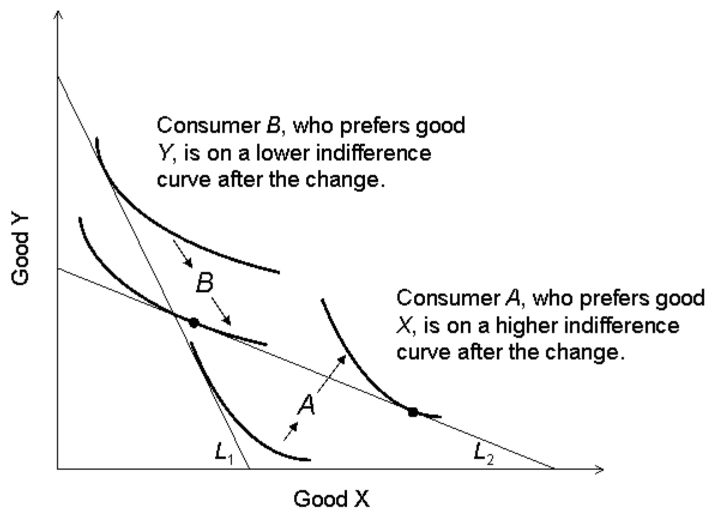
   Using August as the base month (referring to the third row of the above table), we calculate the Laspeyres price index by dividing each cell in that row by $45.60 (the cost of the base bundle in the base month). The price index for June is 0.721;

the price index for July is 0.930; the price index for August is 1.000. According to this measure, Arnold's cost of living increased by 29.0% from June to July, 7.5% from July to August, and 38.7% from June to August.

c. They are not exactly the same, but they are relatively close. In fact, the June to August price level increases are nearly identical. The differences come because Arnold changed his consumption bundle each month, probably in response to the changing prices.

6.12

It is possible because people have different preferences. In the drawing to the right, a decrease in the price of *X* and an increase in the price of *Y* affect consumer *A* and consumer *B* differently. Consumer *A*, who prefers good *X*, is better off (on a higher indifference curve), and consumer *B*, who prefers good *Y*, is worse off (on a lower indifference curve).



6.13

This question says that Sheryl spends all of her money on sailing. Since she earns a wage of \$20 when she works and spends \$10 per hour when she sails, the following equality must hold: $\$20(H_W) = \$10(H_S)$. Since she has 15 hours per day total that she spends either working or sailing, we know that $H_W + H_S = 15$, or $H_S = 15 – H_W$. We can substitute this into the prior equality:

$20(H_W) = 10(15 – H_W)$
$20H_W = 150 – 10H_W$
$30H_W = 150$
$\boldsymbol{H_W = 5}$

This means that she spends five hours working and ten hours sailing if she earns \$20 per hour. To find her labor supply curve, we simply leave her wage as a variable, *w*:

$w(H_W) = 10(15 – H_W)$
$wH_W = 150 – 10H_W$
$(10 + w)H_W = 150$
$\boldsymbol{H_W = 150/(10 + w)}$

The function above gives her hours worked as a function of her wage, which makes it her labor supply curve. Her labor supply curve is downward sloping; as w increases, H_W falls. The reason for this is that, as her wage increases, she more quickly earns the money she wants to spend sailing. Since the price of sailing ($10) does not change, it does not make sense for Sheryl to work *more* in response to an increase in her wage.

For example, at a wage of $20, Sheryl spends five hours working to earn $100 per day, which she spends over ten hours of sailing (at $10 per hour). If she got a raise to $25 per hour and did not change the number of hours she worked, she would now be earning $125 per day. In her ten hours leftover for sailing, she cannot possibly spend this $125, because the price of sailing is only $10 per hour. To remedy this, she would reduce her work time (to about 4 hours and 17 minutes) and increase her sailing time (to about 10 hours and 43 minutes) until the money she earned equaled the money she spent sailing ($107.14).

6.14

Because Alejandro believes concert tickets and film tickets to be 1:1 complements, he will always purchase an equal number of them. If the price of a film ticket were to rise, he would be able to purchase fewer "pairs" and thus he would purchase fewer of each. To compensate him for this price increase, we would have to give him enough income to reach his prior level of utility. Because he believes these goods are perfect complements, he has right angle indifference curves, so the cheapest point on his initial indifference curve is his initial consumption bundle (see the explanation to End-of-Chapter Exercise 6.1 for a drawing of this scenario). Therefore, Alejandro's compensated quantity demanded for film tickets (and likewise concert tickets) is going to be equal to quantity demanded before the price change.

To figure out what Alejandro's current consumption bundle is, we use the condition that he always purchases these goods in pairs ($F = C$) and plug it into the budget constraint.

$M = P_C C + P_F F$
$\$200 = \$12C + \$8F$
$\$200 = \$12(F) + \$8F$
$\$200 = \$20F$
$\boldsymbol{F = 10}$

Therefore, both C and F equal 10. If this is the case, then Alejandro's compensated demand curve for film tickets has the equation $F = 10$; it is a vertical line at this level of consumption, because when compensated, he will return to this same consumption bundle, regardless of the new price ratio.

In In-Text Exercise 5.7, we found Alejandro's uncompensated demand curve for concert tickets, but his uncompensated demand curve for film tickets can be inferred from it to be $F = 200 / (12 + P_F)$.

The compensated demand curve for film tickets, $F = 10$, is steeper than the uncompensated demand curve because it is vertical, indicating that film tickets are a normal good for Alejandro. The two curves cross, as they ought to, at a price of $8.

6.15

Even if the uncompensated demand curve was upward-sloping (as in the case of a Giffen good), the compensated demand curve would still be downward-sloping. Since it is better to use the compensated demand curve to calculate consumer surplus anyway, the upward-sloping uncompensated demand curve does not present a problem.