CHAPTER 5
MARGINAL UTILITY AND CONSUMER CHOICE

Chapter in a Nutshell

In Chapter 3, we studied the law of demand, noting that when price falls, quantity demanded increases. But why? It seemed obvious, didn't it? In this chapter, we explore the obvious to explain the law of demand. We’ll find that the explanation for the law of demand lies in the concepts marginal utility, total utility, and the marginal-utility-to-price ratios for different goods. Some other new concepts that are presented in this chapter to help us understand consumer choice include the law of diminishing marginal utility, consumer surplus, producer surplus, and interpersonal comparisons of utility. This chapter gets to the bottom of why people buy what they do.

After working through this chapter, you should be able to:

- Explain what is meant by the term marginal utility.
- Relate the concepts total utility and marginal utility to each other.
- Describe the meaning of the law of diminishing marginal utility with an example.
- Present an explanation for the water-diamond paradox.
- Account for the law of demand using marginal-utility-to-price ratios.
- Explain the logic behind the marginal-utility-to-price ratio equalization rule.
- Give an examples of consumer surplus and producer surplus.

Discuss how interpersonal comparisons of utility can be useful to policymakers.

Concept Check — See how you do on these multiple-choice questions.

Think about the definition of marginal utility as you consider the possible answers to this question. Marginal utility is the addition to total utility from consuming one more unit. What must happen to the marginal utility for most goods as more and more units are consumed?

1. The law of diminishing marginal utility holds that
   a. as people consume more of a good, total utility increases, then decreases
   b. both water and diamonds have a low marginal utility in the desert
   c. marginal utility diminishes when too much is consumed
   d. increasing consumption leads to smaller additions to total utility
   e. total utility actually decreases for some consumers if they consume too much

A paradox is a seemingly contradictory statement. What is paradoxical about the value of water and diamonds?

2. The paradox in the water-diamond paradox is that
   a. water is very useful but has a low value and diamonds are less useful but have a high value
   b. diamonds are expensive and water is cheap
   c. diamonds have a high total utility but a low marginal utility
   d. the price of water is high but its marginal utility is low, while the opposite is true for diamonds
   e. water is a very abundant but priceless resource, while diamonds are scarce but easy to price

Marginal utility is the satisfaction generated by the last unit consumed. Price is the dollar amount spent for the last unit. Which of the responses is the right answer?
3. The **marginal-utility-to-price ratio** is a representation of the
   a. law of demand
   b. total satisfaction a consumer gets from a good
   c. additional satisfaction a consumer gets from a good
   d. satisfaction per dollar spent that a consumer gets from a good
   e. true market value of a good determined by supply and demand

Do the prices you pay for goods match what you are willing and able to pay for them? Consider items that you buy in bundles of units like a six-pack of soda. How much are you willing to pay for the first can of soda versus the second, the third, and so on? Is the price different for each can? Consumer surplus relates to the fact that although the price is the same for each can (the price of the six-pack divided by six), your willingness to pay is probably greater for the first can than it is for the sixth can.

4. To say that some people enjoy **consumer surplus** means that they
   a. pay less than they would have been willing to pay for a good
   b. are accomplished shoppers who only purchase products that are good values
   c. pay exactly what a good is worth to them
   d. only purchase items that are on sale since the sale increases the marginal utility-to-price ratio
   e. pay a price that is higher than they expected to pay for an item

Utility is the satisfaction that a person enjoys from consuming a good. Are tastes the same for all people? How can we compare the satisfaction that different people enjoy from consuming the same good? How can we compare the satisfaction different people experience from their last dollars of income?

5. We are unable to make **interpersonal comparisons of utilities** of money because
   a. the law of diminishing marginal utility does not apply to money
   b. it is impossible to compare the satisfaction different people get from money
   c. the measurement of utility in hypothetical units makes comparisons impossible
   d. money has a high total utility but a low marginal utility
   e. money has a low total utility but a high marginal utility

**Am I on the Right Track?**

Your answers to the questions above should be d, a, d, a, and b. Utility may sound like a strange concept for economists to use, but it is really quite simple. Utility is the satisfaction one derives from consuming a good. Though it is difficult to measure in a precise way, we all know that we do experience satisfaction from consumption. Marginal utility and total utility are related. Marginal utility is the extra satisfaction a person enjoys from consuming one more unit of a good. Total utility is the satisfaction experienced from consuming a certain amount of a good. Marginal utility can be divided by the price of a good to get the extra satisfaction per dollar spent. These marginal-utility-to-price ratios can then be used to show that demand curves slope downward. That is to say, as the price of a good decreases, the marginal-utility-to-price ratio increases, so a person will consume more of a good. Other concepts related to utility and consumer choice are consumer surplus and the problems inherent in making interpersonal comparisons of utility. Work through the exercises that follow to make sure that you thoroughly understand these concepts.
**Key Terms Quiz**  —  Match the terms on the left with the definitions in the column on the right.

1. utils  _____ a. comparison of marginal utilities between people
2. marginal utility per dollar  _____ b. the total satisfaction from consumption
3. utility  _____ c. smaller additions to total utility from consumption
4. MU/P equalization principle  _____ d. the feeling of satisfaction from consumption
5. marginal utility  _____ e. hypothetical units for measuring utility
6. consumer surplus  _____ f. satisfaction per dollar spent for a unit of a good
7. producer surplus  _____ g. addition to satisfaction from consuming one more unit
8. total utility  _____ h. principle by which consumers arrange consumption
9. interpersonal comparisons of utility  _____ i. difference between the price at which a producer is willing to supply a good and the market price
10. law of diminishing marginal utility  _____ j. utility that a consumer enjoys by paying less than he or she is willing and able to pay for a good

**Graphing Tutorial**

If we agree to measure utility in utils, then graphing total utility and marginal utility functions is uncomplicated. Suppose that the information in the following table represents Jo’s total utility and marginal utility measured in utils from drinking cups of herbal tea. A larger number of utils means that Jo is more satisfied from drinking tea.

<table>
<thead>
<tr>
<th>Cups per Day</th>
<th>Total Utility</th>
<th>Marginal Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>20</td>
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</tr>
<tr>
<td>2</td>
<td>38</td>
<td>18</td>
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<td>3</td>
<td>52</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>64</td>
<td>4</td>
</tr>
</tbody>
</table>

Note how marginal utility can be calculated from total utility. Marginal utility is defined as the change in total utility divided by the change in the quantity consumed. Written mathematically, we have \( MU = \Delta TU / \Delta Q \). Each value in the marginal utility column is the difference in total utilities between the pair of consumption levels. For example, as consumption increases from zero to one cup, total utility increases by 20 utils, so the marginal utility of the first cup is 20 utils. Marginal utility and total utility are the same for the first cup. But for the second cup, total utility increases by only 18 units, from 20 to 38. Hence, the marginal utility of the second cup is 18.

The graph below shows Jo’s total utility function for consuming herbal tea. This total utility function illustrates the law of diminishing marginal utility because it becomes less steep as more tea is consumed. Drinking more cups per day increases total utility, but at a decreasing rate so the total utility function becomes flatter as consumption increases. For example, moving from point a at the origin to point b, we see that total utility increases to 20 from drinking the first cup. However, drinking the second cup moves Jo to point c where total utility is 38, an increase of only 18 utils compared to 20 for the first cup. Trace out the smaller and smaller increases in total utility that Jo derives from drinking the third, fourth, and fifth cups by moving along the total utility function through points d, e, and f. All total utility functions that exhibit the law of diminishing
marginal utility become flatter as consumption increases.

The figures for marginal utility from the table are represented graphically below. Note how the law of diminishing marginal utility shows up as a negative slope for the marginal utility function. Points a through e on the graph show the marginal utility Jo derives from the first through the fifth cups of tea. Even though total utility is rising, each cup of tea consumed adds less to total utility than the cup consumed previously. Makes sense doesn’t it? If the total utility function increases at a decreasing rate, then the marginal utility function must have a negative slope.

Ultimately, the shapes of total utility and marginal utility functions depend on an individual’s tastes. You can
create examples of different individual utility functions for a variety of goods and practice graphing them.

**Graphing Pitfalls**

Consider the total utility function drawn below. This total utility function has a positive slope, and the slope gets steeper as consumption increases. Does this make sense given what you know about the law of diminishing marginal utility? If the total utility function has an increasingly steep slope, then marginal utility must be increasing, not diminishing. While this might be true for some individuals consuming some goods, such as a person who is completing a stamp collection, it isn’t the shape we usually expect when considering utility functions. So, if you happen to draw a total utility function with an increasingly steep slope, go back and carefully check the numbers on which you based your graph. Either you are describing some unusual tastes, or you’ve made a mistake drawing the graph.

You won’t find too many total utility functions that look like this!

**True-False Questions** — If a statement is false, explain why.

1. Utility is the satisfaction or enjoyment that a person obtains from consuming a good that can be measured precisely by psychological tests. (T/F)

2. Utils are the units in which psychologists’ testing devices are calibrated to determine the utility people obtain from consumption. (T/F)

3. The total amount of satisfaction someone enjoys from consuming a specific quantity of goods is called total utility. (T/F)

4. Two people who consume precisely the same quantity of a particular good will enjoy the same total utility levels. (T/F)
5. Marginal utility is always a very small quantity. (T/F)

6. The law of diminishing marginal utility suggests that as the quantity consumed increases, the addition to total utility from an additional unit consumed will decrease. (T/F)

7. The water-diamond paradox is that water is extremely useful but is valued at a low rate, while diamonds are less useful but are valued at a much higher rate. (T/F)

8. If the marginal-utility-to-price ratio is the same for all but a few goods, then a consumer has maximized total utility. (T/F)

9. If Ruth's consumer surplus is zero, then she must be paying exactly the highest amount that she was willing to pay for a good. (T/F)

10. Marginal utility analysis can be used to explain government policies regarding taxation and the redistribution of income from the rich to the poor given the "reasonableness" of diminishing marginal utility of income. (T/F)

11. If the marginal-utility-to-price ratio for oranges is higher than the marginal-utility-to-price ratio for bananas when Josie leaves the store, then she should have purchased fewer oranges and more bananas. (T/F)

12. In choosing to purchase a combination of goods, consumers must consider prices and not just utilities because goods are not free. (T/F)

13. If the law of diminishing marginal utility applies, then a graph of total utility will show a positive slope that increases as the number of units consumed increases. (T/F)

14. Consumer surplus is the difference between what a consumer is willing to pay for a good and what the consumer actually pays. (T/F)

15. If water is extremely scarce, then the marginal utility of an additional unit is high and the water-diamond paradox is less apparent. (T/F)

Multiple-Choice Questions

1. The law of demand tells us that
   a. the quantity demanded increases as price falls
   b. demand increases because price falls
   c. people respond to price changes
   d. demand creates its own supply, meaning that if there's a demand, supply will be created to satisfy it
   e. demand depends on people having income to satisfy it
2. The law of diminishing marginal utility
   a. is another way of expressing the law of demand
   b. states that people's inclination to consume basic goods falls as incomes increase
   c. shows that goods lose their individual values as the total utility of all goods decreases
   d. is the utility equivalent to the law of increasing costs
   e. states that total utility rises at a decreasing rate as consumption increases

3. The water-diamond paradox can be explained by showing that
   a. water's total utility may be lower than diamonds', but its marginal utility is higher
   b. water's total utility may be lower than diamonds', and its marginal utility is lower as well
   c. water's total utility is less than its marginal, but diamonds' total utility is higher than their marginal
   d. water's total utility may be higher than diamonds', but its marginal utility is lower
   e. total utility for both water and diamonds decreases as their marginal utilities increase

4. Given the marginal-utility-to-price ratio equalization principle, if \( \frac{MU_1}{P_1} > \frac{MU_2}{P_2} \),
   a. the consumer should consume more of good 1 and less of good 2
   b. the consumer should consume more of good 2 and less of good 1
   c. total utility of good 1 is greater than total utility of good 2
   d. total utility of good 2 is greater than total utility of good 1
   e. the price of good 1 must fall

5. The law of diminishing marginal utility suggests that
   a. total utility will begin to diminish
   b. additional units of consumption will add less to total utility
   c. consumers' wants are insatiable
   d. most consumers will limit their consumption even when they earn high incomes
   e. marginal utility diminishes faster than total utility as more goods are consumed

6. The marginal-utility-to-price ratio tells us that if the price of a good falls, then, ceteris paribus
   a. its marginal-utility-to-price ratio falls
   b. its marginal-utility-to-price ratio rises
   c. its marginal utility falls
   d. its marginal utility rises
   e. consumers buy less of the good

7. The value of a good to a consumer depends on
   a. its total utility
   b. the marginal utility of the first unit consumed
   c. the average utility of the units consumed
   d. the marginal utility of the last unit consumed
   e. the ratio of its marginal utility to total utility

8. Consumer surplus for the whole market
   a. is the value placed on the sum of the marginal utilities of a good for all consumers
   b. is the triangular area between the demand curve and the equilibrium price in a demand and supply graph
   c. corresponds to the area below the market price in a graph of the demand curve
   d. is the utility that is left over after a consumer pays for a good
   e. emerges when the consumer pays the equivalent of the good's marginal utility
9. You would be inclined to bid on a good at an auction if
   a. its MU/P was higher than those for other goods you consume
   b. its MU/P was lower than those for other goods you consume
   c. the consumer surplus was less than its price
   d. the consumer surplus was greater than the marginal utility from consuming the good
   e. the marginal utility was higher than its price

10. Suppose that Jessica’s MU/P is 8 for swimming lessons, 12 for voice lessons, and 4 for piano lessons. In order for Jessica to maximize total utility, she should definitely
   a. take more swimming lessons
   b. take more voice lessons
   c. take more piano lessons
   d. find some other activities because the values for MU/P are very low
   e. take fewer lessons of each type

11. Suppose that Ron paid a scalper (a seller in the black market for tickets) $300 for a ticket to see the Rolling Stones and his true willingness to pay was $500. We can be sure that
   a. the ticket scalper extracted all the possible consumer surplus from Ron
   b. Ron’s consumer surplus was low because he paid more than face value for the ticket
   c. Ron’s consumer surplus was the $60 face value of the ticket
   d. Ron’s marginal-utility-to-price ratio for the concert was extremely high compared to that for other goods
   e. Ron enjoyed $200 of consumer surplus from the purchase

12. Suppose that development of oil fields around the Caspian Sea leads to an increase in the world supply of gasoline. This change in the market for gasoline would lead to
   a. an increase in the equilibrium price and lower consumer surplus
   b. a decrease in the equilibrium price and greater consumer surplus
   c. an increase in the equilibrium price and greater consumer surplus
   d. a decrease in the equilibrium price and lower consumer surplus
   e. no change in consumer surplus

13. Suppose that George goes to his favorite ice cream store and buys three single -dip cones, the first for three dollars, the second for two dollars, and the third for one dollar, but enjoys no consumer surplus from the experience. We know that George must
   a. have paid the same price for each cone
   b. have been cheated by the ice cream store-owner
   c. not like ice cream very much
   d. have paid prices for the cones that correspond to points on his demand curve
   e. not have maximized total utility that day

14. As the price of a good falls, people buy more of it because
   a. the demand for the good increases
   b. they have more income to spend on the good
   c. the marginal utility from additional units of consumption of the good increases
   d. the marginal-utility-to-price ratio for the good increases
   e. consumer surplus from consumption of the good increases

15. An increase in the price of a good causes people to buy less of it because
   a. the demand for the good decreases
   b. they have less income to spend on the good
   c. the marginal utility from additional units of consumption of the good decreases
   d. the marginal-utility-to-price ratio for the good decreases
   e. consumer surplus from consumption of the good decreases
16. If there is diminishing marginal utility of income, then it may increase social welfare (assuming that it is reasonable to compare utility levels among people) to increase taxes on
   a. the incomes of the rich and give the funds to the poor
   b. the incomes of the poor to provide funds for job training
   c. cigarettes
   d. the incomes of the poor and give it to the richer classes
   e. consumption goods

17. Producer surplus can be represented graphically in a demand and supply diagram as the
   a. area between price and the supply curve
   b. slope of the demand curve
   c. elasticity of the demand curve
   d. area above the demand curve
   e. area between the demand curve and price

18. One might argue that French chefs understand the law of diminishing marginal utility better than American chefs because
   a. French chefs are able to price their meals higher than American chefs
   b. the French serve many courses of small portions, keeping the marginal utility of each one high
   c. the French focus on large portions and unlimited trips to the salad bar, keeping total utility high
   d. the only way to get people to eat American cuisine is to keep prices very low, suggesting a low marginal utility
   e. the waiters in French restaurants are instructed to help customers to equate the MU/P among different menu items by carefully explaining the various choices

19. Suppose that your roommate comes back to the dormitory exclaiming about what a great deal she got on a new shirt that she would have purchased at the regular price for $35, but she bought on sale for $6. An appropriate response would be to
   a. make an interpersonal comparison of utility and remark that the shirt is ugly and not worth even $6 to you
   b. suggest that your roommate is now enjoying $29 of consumer surplus
   c. suggest that the shirt was on sale because it has a low marginal utility
   d. suggest that your roommate’s total utility from the shirt is 35 utils
   e. suggest that your roommate’s total utility from the shirt is at least $29

20. A consumer who has spent all of her income on clothes and food and finds that her marginal-utility-to-price ratio is higher for clothes than for food should, in the future, rearrange purchases to maximize total utility by
   a. purchasing more food and less clothes
   b. purchasing more of both commodities
   c. purchasing more clothes and less food
   d. purchasing less of both commodities
   e. paying closer attention to the law of diminishing marginal utility for both commodities

The following questions relate to the interdisciplinary and theoretical perspectives in the text.

21. Research on the marginal utility of money by sociologists and political scientists suggests that
   a. most people have an overwhelming desire for more income because more goods increase their utility
   b. people are far happier in rich countries than in poor countries because more consumption goods are available
   c. hard work that increases income is rewarding because it increases consumption and utility
   d. the marginal utility of income above the subsistence level is not very great
   e. material possessions are more important to happiness than friends, family, and health
22. Suppose that you are an engineering major and you are required to take English 101, the writing class required of all first-year students. You aren’t a great writer but at least you know that every sentence needs a subject, a verb, and the appropriate modifiers. You can earn a B grade in the class in 100 hours of out-of-class work, whereas, the average first year student requires 150 hours of work to earn a B. In this case, you enjoy
   a. no consumer surplus
   b. 50 hours of consumer surplus
   c. no producer surplus
   d. 50 hours of producer surplus
   e. the market price for a B grade in English 101, which is only 100 hours

23. Which of the following activities is least likely to exhibit the law of diminishing marginal utility?
   a. a student answering multiple choice questions for an economics course
   b. a wealthy individual shopping for a third luxury car
   c. a child at a new school making ten new friends at once
   d. a track athlete at practice running the 400 meter dash ten times in a row
   e. a rock musician playing a “hit” song in concert for the 100th time

24. Experiments involving laboratory white rats suggest that
   a. rats do not respond to price changes in the same way that human consumers do
   b. as a rat is forced to bar-push more for a reward, they do so in order to consume more
   c. rats have very narrow tastes, so experiments that test their consumption behavior are not very meaningful
   d. rats rearrange their consumption in response to changes in the “price” of available food items
   e. rats can distinguish between different brands of root beer

Fill in the Blanks

1. Utility is the __________________ or __________________ a person obtains from consuming a good.
2. The law of diminishing marginal utility suggests that as more is __________________ the
   __________________ a person derives from each additional unit __________________.
3. A person’s utility is __________________ when the ratios of ____________________________ for
   each of the goods consumed are ______________.
4. The difference between the ______________ amount a person would be willing to pay for a good or
   service and the amount actually paid is called ____________________________.
5. We are unable to make precise ____________________________ of the marginal utilities of money, which
   has sobering implications for tax policies that impose higher ____________________ on the wealthy.

Discussion Questions

1. Why do economists find utility theory useful?
2. What is the law of diminishing marginal utility? Do all people consuming all goods exhibit this law? Give some examples of possible exceptions to the law of diminishing marginal utility.

3. How can the water-diamond paradox be resolved by using the concept of marginal utility?

4. Explain the logic behind the marginal-utility-to-price ratio equalization principle.

5. Why are demand curves for most goods downward sloping?

6. Typically, people pay less for goods and services than they are willing and able to pay. What is the concept that economists have developed to explain this phenomenon?

7. Economists try to avoid making interpersonal comparisons of utility. However, such comparisons may seem reasonable and useful to make, especially from the standpoint of social policies like taxation and programs to aid the poor. Explain.
Problems

1. a. The following table portrays Tony’s total utility from consumption of Spiderman comic books — he is an avid collector. The column for marginal utility has been left blank. Calculate the values for marginal utility and fill in the blanks in the marginal utility column.

<table>
<thead>
<tr>
<th>Number of Comics</th>
<th>Total Utility</th>
<th>Marginal Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>190</td>
<td></td>
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<td>4</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>380</td>
<td></td>
</tr>
</tbody>
</table>

b. Does Tony experience the law of diminishing marginal utility from consuming Spiderman comics? How do you know?

c. In the space below, sketch graphs for the total utility function and the marginal utility function.

2. Jacob is a Lego maniac, but he also likes Super Soaker squirt guns. The following table shows Jacob’s total utility and marginal utility from Legos and squirt guns measured in utils.

<table>
<thead>
<tr>
<th>Quantity of Legos</th>
<th>TU</th>
<th>MU</th>
<th>MU/P</th>
<th>Quantity of Squirt Guns</th>
<th>TU</th>
<th>MU</th>
<th>MU/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
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<td>5</td>
<td>5</td>
<td>102</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
a. Suppose the price of Legos is $5 per set and the price of a squirt gun is $8 per gun. Compute the marginal-utility-to-price ratios for Legos and squirt guns and enter these values in the table.

b. How many sets of Legos and how many squirt guns will Jacob purchase if he has $26 to spend? Carefully explain how you arrived at your answer.

c. Now suppose the price of Legos falls to $2.50 per set while the price of squirt guns stays the same. How many sets of Legos and how many squirt guns will he purchase? Show how you arrived at your answer.

d. Draw Jacob’s demand curve for Legos between the prices $5 per set and $2.50 per set. Why does it have a negative slope?

3. Pat has $30 to spend on sugar and spice. Pat’s marginal utilities from sugar and spice are shown in the following table.

<table>
<thead>
<tr>
<th>Quantity of Sugar</th>
<th>MU</th>
<th>MU/P</th>
<th>Quantity of Spice</th>
<th>MU</th>
<th>MU/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td></td>
<td>1</td>
<td>40</td>
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</tr>
<tr>
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<td></td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
a. Suppose that a unit of sugar is priced at $5 and the price of a unit of spice is $10. Compute the marginal-utility-to-price ratios for sugar and spice and enter these values in the table.

b. Given Pat’s $30 budget, how many units of sugar and spice will be purchased? Explain how you arrived at this answer.

c. Suppose the price of spice stays constant at $10 and the price of sugar falls to $3. How many units of sugar will be demanded at this price? Carefully explain your reasoning.

d. How many units of sugar will Pat purchase if the price falls to $2, holding the price of spice constant at $10 per unit?

e. Draw Pat’s demand curve for sugar. Does it conform to the law of demand? Why?
4. The following table shows Chloe’s demand schedule for Beanie Baby Dolls.

<table>
<thead>
<tr>
<th>Price per Doll ($)</th>
<th>Quantity Demanded</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

a. Use the information in this table to sketch a graph of Chloe’s demand curve for Beanie Baby Dolls.

b. Suppose that the price of Beanie Baby Dolls is $8. How much consumer surplus does Chloe enjoy? How did you arrive at this answer?

c. How does Chloe’s consumer surplus change if the price of dolls falls to $4? What is her consumer surplus if Beanie Baby Dolls are free? Justify your answers.
Everyday Applications

1. The next time you go shopping for groceries, think about the implications of the marginal-utility-to-price equalization rule. Does this rule make sense in the context of your everyday experience? Why or why not? Do people who haven’t studied principles of economics really behave according to this principle?

2. As part of the same shopping trip, do a rough calculation of your consumer surplus. What you are doing in computing your consumer surplus is estimating your demand curve for different goods. How do price elasticities of demand for various goods that you purchase compare to one another? Did you pass by goods in the store because they were too expensive? What price would have induced you purchase these goods? Did you go for any “buy one at the regular price and get the second at half price” deals? Do store owners seem to intuitively understand the role that marginal-utility-to-price ratios play in consumer choices?

Economics Online

Using your favorite Web search engine, type in “virtual mall” and embark on an extraordinary shopping trip. Consider the implications for the creation of consumer surplus from shopping online. On the one hand, the potential for consumers to compare prices is much greater as a result of online shopping. Travel time between stores has been dramatically reduced. But consider the individual who likes to shop in person. Will this sort of individual — one who likes to touch the merchandise, discuss options with a salesperson, etc. — find it advantageous to shop online? Suppose a person derives substantial utility from the shopping experience. Will shopping online ever compare to the real thing for these people?

Answers to Questions

Key Terms Quiz

a. 9  f. 2
b. 8  g. 5
c. 10 h. 4
d. 3  i. 7
e. 1  j. 6

True-False Questions

1. False. We measure utility in hypothetical units called utils because utility cannot be measured precisely.
2. False. Utils are hypothetical units. There are no machines calibrated in utils to measure utility.
3. True.
4. False. Each person has a unique utility function for the good. Therefore, their total utility levels are probably different. Remember, it is impossible to make precise interpersonal comparisons of utility.
5. False. Marginal utility is the addition to total utility from consuming one more unit of a good. Marginal utility may be large or small. For example, the marginal utility of the first gulp of water you take after a long run on a hot day is quite high.
6. True.
7. True.
8. False. In order to maximize utility, a consumer must equate the ratio of marginal utility to price for all goods.
10. True.
11. False. Josie should have purchased more oranges and fewer bananas.
12. True.
13. False. If the law of diminishing marginal utility applies, then the total utility curve will have a positive
    slope that decreases as more is consumed.
14. True.
15. True.

Multiple-Choice Questions

1. a
2. e
3. d
4. a
5. b
6. b
7. d
8. b
9. a
10. b
11. e
12. b
13. d
14. d
15. d
16. a
17. a
18. b
19. b
20. c
21. d
22. d
23. c
24. d

Fill in the Blanks

1. satisfaction; enjoyment
2. consumed; extra utility; diminishes
3. maximized; marginal utility to price; equal
4. maximum; consumer surplus
5. comparisons between people; taxes

Discussion Questions

1. Economists developed utility theory in order to explain consumer choice and the principles underlying
demand. For example, why does quantity demanded increase as price decreases? Consumers purchase
more of a good as its price falls because the marginal-utility-to-price ratio for that good has risen relative to
the marginal-utility-to-price ratio for other goods. It is perfectly clear that people gain satisfaction, or
utility, from consumption. Consumers compare the additional satisfaction (marginal utility) per dollar spent
between different goods in making their choices.

2. The law of diminishing marginal utility states that as consumption increases, the addition to total utility from
more consumption will eventually decrease. Thinking about exceptions to this law only seems to reinforce
its universality. Perhaps certain kinds of addictions like alcoholism and drug addictions could be considered
exceptions. But even in these cases, individuals eventually experience diminishing marginal utility (if
not negative utility) as their lives unravel around them.

3. The water-diamond paradox is easy to explain with utility theory. Since diamonds are scarce, most
people have very few of them, and the marginal utility of the last one consumed is very high. Therefore,
even though the total utility of diamonds is low relative to the total utility of water, the marginal utility of
diamonds is very high compared to the marginal utility of water, which is abundant in most parts of the
world. Therefore, people value the last unit of scarce diamonds they consume at a much higher rate than the
last unit of abundant water they consume.

4. Consumers maximize utility from consumption when the ratios of marginal utility to price are the same for
all goods consumed. This is logical because the sensible consumer will always rearrange purchases from
goods whose MU/Ps are lower to ones whose MU/Ps are higher. After all, consumers are always trying
to get the most possible satisfaction per dollar spent. By consuming more of the goods with the high MU/P
and less of the goods with low MU/P, these ratios are brought into equality. The marginal utility of the next
units consumed of the high MU/P goods is a little bit lower because of the law of diminishing marginal utility. Similarly, the marginal utility of the low MU/P goods increases a little bit as fewer of these goods are consumed. Therefore, the rearrangement of goods consumed drives the MU/Ps into equality.

5. The law of demand tells us that demand curves will be downward sloping. That is, as the price decreases, quantity demanded increases. Marginal utility analysis tells us why. When the price of a good decreases, its MU/P increases relative to the MU/P for other goods. Therefore, consumers will rearrange their purchases to buy more of the good whose price has fallen. After all, this good has a higher satisfaction per dollar spent than other goods, given the drop in its price.

6. Consumers are seldom charged their exact willingness to pay for each unit of a good that they consume. That is, they aren’t charged prices directly from their demand curves for all the units of various goods they purchase. Therefore, consumers are able to enjoy utility expressed as the difference between the dollar amount that they were willing to pay and the price they actually paid. This difference between what people pay for a good and what they would have been willing to pay is called consumer surplus.

7. Interpersonal comparisons of utility can never be exact. It is natural that people’s tastes differ from one another, and this is as true for money as it is for any other good. Some people have a stronger taste for money than do others. And, while it may be possible, in some cases, that the marginal utility of the last dollar earned by a rich person exceeds the marginal utility of the last dollar earned by a poor person, it seems reasonable in most cases that the reverse is true. That is to say, in most instances, the marginal utility of the last dollar to the poor person (who may be purchasing necessities with it) is higher than the marginal utility of the last dollar to the rich person (who may be enjoying luxury goods with the last dollar). Therefore, given the reasonableness of such interpersonal comparisons of the marginal utility of money, it follows that total utility in the economy rises when the rich are taxed at a higher rate than the poor and some of these tax revenues are used to support programs that aid the poor. Hence, interpersonal comparisons of the marginal utility of money do have a role to play in the creation of social policies.

Problems

1. a. The table with the marginal utility column completed is shown below.

<table>
<thead>
<tr>
<th>Number of Comics</th>
<th>Total Utility</th>
<th>Marginal Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>190</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>270</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>330</td>
<td>60</td>
</tr>
<tr>
<td>5</td>
<td>380</td>
<td>50</td>
</tr>
</tbody>
</table>

b. Tony does experience the law of diminishing marginal utility in his consumption of Spiderman comic books. The figures in the marginal utility column of the table decrease from 100 to 50 from the first comic book through the fifth.

c. Tony’s total and marginal utility functions are shown on the following page.
2. a. The completed table with the marginal-utility-to-price ratio computations is shown below.

<table>
<thead>
<tr>
<th>Quantity of Legos</th>
<th>TU</th>
<th>MU</th>
<th>MU/P</th>
<th>Quantity of Squirt Guns</th>
<th>TU</th>
<th>MU</th>
<th>MU/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>1</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td>1</td>
<td>50</td>
<td>50</td>
<td>6.25</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>17</td>
<td>3.4</td>
<td>2</td>
<td>75</td>
<td>25</td>
<td>3.125</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>13</td>
<td>2.6</td>
<td>3</td>
<td>90</td>
<td>15</td>
<td>1.8</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>10</td>
<td>2</td>
<td>4</td>
<td>100</td>
<td>10</td>
<td>1.25</td>
</tr>
<tr>
<td>5</td>
<td>65</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>102</td>
<td>2</td>
<td>.25</td>
</tr>
</tbody>
</table>

b. With $26 to spend, Jacob will purchase 2 Lego sets and 2 squirt guns. He begins by purchasing a
106  CHAPTER 5  MARGINAL UTILITY AND CONSUMER CHOICE

squir [2] gun with its MU/P equal to 6.25. Then he purchases 2 Lego sets, which leaves him with $8 that he spends on a second squirt gun. Each purchase corresponds to the highest possible MU/P that is available to him.

c. A decrease in the price of Lego sets to $2.50 changes the values in the MU/P column for Legos. Each of these numbers doubles since the price falls in half from $5 to $2.50. So, we have values in the column equal to 8, 6.8, 5.2, 4, and 2 for the first through fifth Lego sets, respectively. If Jacob still has $26 to spend, he will purchase items in the following order — 2 Lego sets, a squirt gun, 2 more Lego sets, and a squirt gun. He will end up with 4 Lego sets and 2 squirt guns.

d. Jacob’s demand curve for Lego sets between the prices $5 and $2.50 per set is shown on the following page. The demand curve has a negative slope because a decrease in the price of Legos relative to other goods (squirt guns in this case) raises the MU/P for Legos. As the price of Legos decreases, Jacob’s quantity demanded increases because his satisfaction per dollar spent on Legos increases.

3. a. The completed table is presented below.

<table>
<thead>
<tr>
<th>Quantity of Sugar</th>
<th>MU</th>
<th>MU/P</th>
<th>Quantity of Spice</th>
<th>MU</th>
<th>MU/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>4</td>
<td>1</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>2.4</td>
<td>2</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>1.8</td>
<td>3</td>
<td>9</td>
<td>.9</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>.7</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>.6</td>
<td>5</td>
<td>5</td>
<td>.5</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>.2</td>
<td>6</td>
<td>3</td>
<td>.3</td>
</tr>
</tbody>
</table>
b. Pat will purchase 2 units of sugar and 2 units of spice. She purchases these items in the following order — sugar, spice, sugar, spice. Each purchase corresponds to the next highest MU/P ratio, which are, in order, 4, 4, 2.4, 2.

c. A fall in the price of sugar to $3 changes the MU/P column to 6.67, 4, 3, 1.67, 1, and .33. Pat will purchase these items in the order sugar, spice, sugar, sugar, and spice. Pat spends $29 of her budget this way. If she had an additional $2, her next purchase would be sugar. So, at $3 per unit, Pat buys 3 units of sugar.

d. A fall in the price of sugar to $2 changes the MU/P column to 10, 6, 4.5, 2.5, 1.5, and .5. Pat will purchase items in the order sugar, sugar, sugar, spice, sugar, sugar, and spice to completely exhaust her budget. She will have purchased 5 units of sugar at $2 per unit.

e. The graph is shown below.

4. a. Chloe’s demand for Beanie Baby Dolls is shown below.
b. If the price of dolls is $8, then Chloe enjoys $8 of consumer surplus on the first doll, $4 on the second
doll, and $0 on the third doll for a total of $12. Consumer surplus is the sum of the difference between
the price she was willing to pay (read from the demand curve) and the price she actually paid ($8).

c. If the price falls to $4, then Chloe’s consumer surplus rises to $12 on the first doll, $8 on the second
doll, $4 on the third doll, and $0 on the fourth doll for a total of $24. These values are the differences between
the price she was willing to pay and the $4 price she actually paid. If the dolls are free, Chloe enjoys $40
of consumer surplus — $16 + $12 + $8 + $4.
APPENDIX

THE INDIFFERENCE CURVE APPROACH TO DEMAND CURVES

Appendix in a Nutshell

Utility analysis suffers from the defect that the unit of measure — utility — cannot itself be measured. No one has yet invented a utilometer! However, it is possible to derive demand curves without using the concept utility in the sense of counting utils. The **indifference curve** approach only relies on our knowledge of the consumer's preferences between sets of goods and the consumer's **budget constraint**. The only assumption necessary in this analysis is that consumers can rank their preferences. That is, the utilities of goods are not really measured with the indifference curve approach. Rather, consumers only need to be able to rate the utilities of sets of goods as greater, less than, or equal to the utilities of other sets of goods. If two sets of goods have equal utilities, then a consumer is said to be indifferent between them.

Indifference curves are defined by combinations of goods that yield identical utility to a consumer. Therefore, all the combinations of goods represented by indifference curves are rated as equally preferred by the consumer. The slope of the indifference curve reflects a **declining marginal rate of substitution**. As a consumer gives up units of one good along an indifference curve, increasing amounts of the other good are required in order to maintain the consumer's level of satisfaction constant. Sets of indifference curves can be drawn as an ascending series with the curve farthest from the origin representing the combinations of goods that yield the highest utility. These sets of indifference curves are called **indifference maps**.

The amount of each good that a consumer will purchase depends on the prices of the two goods and the consumer's income. This information defines the **budget constraint** — the sum of the price times the quantity of each good that is consumed must be equal to the consumer's income. Algebraically, we can write the budget constraint as

\[ I = P_1Q_1 + P_2Q_2 \]

where \( P_1 \) and \( P_2 \) stand for the prices of the two goods, \( Q_1 \) and \( Q_2 \) stand for the quantities, and \( I \) is income. A consumer's choice of a combination of goods 1 and 2 that maximizes utility given prices and income is the point where the budget constraint (or line) lies tangent to an indifference curve. As the price of one of the goods is allowed to change — suppose it increases — then the budget line rotates toward the origin along the axis of the good whose price is rising. The increase in price will map out tangent points on indifference curves that yield smaller quantities consumed of the good whose price increases. Thus, as the price of a good increases, the quantity demanded decreases, and we can draw the familiar downward-sloping demand curve.

*After you study the material in this appendix, you should be able to:*

- Explain why economists use the **indifference curve approach** to study consumer choice.
- Construct **equally preferred sets of goods** to form an **indifference curve**.
- Show that the **marginal rate of substitution** declines as one good is substituted for another.
- Rank the levels of utility for indifference curves that form an **indifference map**.
- Shift a **budget constraint** by changing the prices of goods and/or a consumer’s income.
- Derive a demand curve by changing the price of a good to shift a budget constraint across a consumer’s indifference map and locating **tangent points** between the budget constraints and indifference curves.
Concept Check — See how you do on these multiple-choice questions.

Remember that we are using the indifference curve approach because counting utils seems farfetched.

1. The **indifference curve approach** to demand curves requires that
   a. a consumer be able to put precise utility values on different sets of goods
   b. utils be counted very carefully
   c. we make interpersonal comparisons of utility
   d. a consumer have a sufficiently large budget to buy many different items
   e. a consumer be able to rank utilities of different goods

   For this question, think about what the term *indifference* means. If someone is indifferent between two combinations of goods, then that person is equally satisfied with either one.

2. An **indifference curve** is formed by constructing combinations of goods that
   a. are rated with higher utilities than other goods
   b. are within the consumer’s budget constraint
   c. are not subject to the law of diminishing marginal utility
   d. yield identical levels of utility for a consumer
   e. are substituted for one another at a constant marginal rate

   Utility is constant along an indifference curve. To keep utility constant, a consumer must substitute increasing amounts of one good in order to accept equal cuts in the amount consumed of the other good.

3. The **marginal rate of substitution** is the rate at which a consumer
   a. measures utils for additional units of consumption
   b. will give up units of one good for units of another good while holding utility constant
   c. runs up against the monthly budget constraint
   d. finds substitute goods for goods whose prices are increasing
   e. compares the utility rankings of sets of goods that might be substitutable

   A budget constraint simply shows the various combinations of goods that a consumer can purchase given the prices of the goods and the consumer’s income.

4. A consumer’s **budget constraint** is formed by
   a. subtracting the cost of various budget items from the consumer’s income
   b. setting the consumer’s income equal to the sum of the price times the quantity for all goods consumed
   c. adding up the prices of all the items in the household budget
   d. comparing the marginal-utility-to-price ratios of the most preferred goods the consumer buys
   e. dividing income by the price of the most expensive good consumed

Am I on the Right Track?

Your answers to the questions above should be e, d, b, and b. Probably the best way to learn the indifference curve approach to demand curves is to work through some numerical examples that allow you to see indifference curves being constructed and their relationship to budget constraints in determining a consumer’s choices of combinations of goods to purchase. The graphing tutorial and the questions that follow give you a chance to do this.
Graphing Tutorial

Graphing indifference curves and budget constraints in order to derive demand curves is a fairly sophisticated procedure. However, if you keep in mind the definitions for the concepts that lie behind the graphs, it isn’t that difficult to do. Remember, our goal here is to derive a downward-sloping demand curve, just as this was our goal in the main part of the chapter.

An indifference curve consists of a set of combinations of goods that yield identical utility to a particular person. The table below shows combinations of bananas and boxes of cereal that provide identical utility to Jerry.

<table>
<thead>
<tr>
<th>Combination</th>
<th>Bananas</th>
<th>Boxes of Cereal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>

These equally preferred combinations of bananas and boxes of cereal are plotted below as an indifference curve.

Note that Jerry’s indifference curve exhibits the principle of declining marginal rate of substitution. Starting at point a and moving to point b, Jerry is willing to give up 6 boxes of cereal for 2 more bananas, giving us a marginal rate of substitution equal to −3. From point b to point c, Jerry is willing to give up only 3 boxes of cereal for 2 more bananas — a marginal rate of substitution equal to −3/2. From point c to point d, the marginal rate of substitution is −1 and from point d to point e, the marginal rate of substitution is −1/2. Jerry trades fewer and fewer boxes of cereal for 2 more bananas while keeping his utility constant because he experiences diminishing marginal utility from more bananas. He isn’t a chimp after all! Because of the declining marginal rate of substitution, the indifference curve is downward sloping and convex with respect to the origin.

We can create another indifference curve for Jerry showing a set of combinations of bananas and cereal that have equal but higher utility than the set of combinations we just considered. Such a set of
combinations would lie above and to the right of the indifference curve we just drew. Suppose we simply add 5 boxes of cereal to every level of banana consumption shown in the graph above. This would do the trick wouldn’t it? A plot of the two indifference curves is shown below.

Now let’s put prices on bananas and boxes of cereal and give Jerry some income and see how much of each good he will purchase. Suppose that bananas are selling for $2 each, cereal costs $1.67 per box, and Jerry has $20 of income. If he spends all of his income on bananas, he can purchase 10. This point, 10 bananas and 0 boxes of cereal, is an endpoint on Jerry’s budget constraint (or line) that is shown below in the graph. The other endpoint is at 11.97 boxes of cereal and 0 bananas, corresponding to Jerry spending all his income on cereal — $20 divided by $1.67 per box. Given these prices and his income, Jerry purchases 5 bananas and 6 boxes of cereal. This choice is the tangent point between Jerry’s budget line and the indifference curve.

Suppose that we let the price of cereal drop to $1 per box and see what Jerry chooses to buy. The price of bananas and Jerry’s income are held constant — $2 per banana and $20. At a price of $1 per box, Jerry
could spend all of his income on cereal and buy 20 boxes. Therefore, the budget line rotates up the cereal axis to intersect at the point 20 boxes of cereal and 0 bananas. This rotation of the budget line is shown in the graph below.

Now that the price of cereal has fallen, Jerry chooses to purchase 14 boxes (he’s stocking up for Elaine who is on a new diet) and only 3 bananas. This is the point labeled f. We have generated enough information to draw Jerry’s demand curve for cereal between the prices $1.67 per box and $1 per box. At $1.67 Jerry buys 6 boxes, and at $1 per box Jerry buys 14 boxes. As an exercise, sketch this demand curve.

**True-False Questions** — If a statement is false, explain why.

1. A consumer’s indifference curve reflects combinations of goods that yield identical utility levels. (T/F)

2. Ian’s utility increases as he moves down along his indifference curve. (T/F)

3. Brian has maximized utility if he consumes at the tangent point between his indifference curve and his budget constraint. (T/F)

4. As the price of a good falls, the intercept for that good on a budget constraint shifts away from the origin. (T/F)

5. The marginal rate of substitution is the rate at which one good can be substituted for another, which is constant along an indifference curve. (T/F)

6. An indifference map consists of many indifference curves drawn in ascending order of utility level as one moves away from the origin. (T/F)
7. If the price of a good doubles, then one intercept for that good on a budget constraint will shift halfway toward the origin. (T/F)

8. If income increases, a budget constraint will shift outward from the origin so that the new constraint is parallel to the old one. (T/F)

9. Deriving the demand curve for a good using the indifference curve approach requires that both goods’ prices be changed simultaneously. (T/F)

10. The indifference curve approach leads to more frequent violations of the law of demand than does the marginal-utility-to-price ratio approach to constructing demand curves. (T/F)

Multiple Choice Questions

1. Which of the following is true about combinations of goods represented by an indifference curve?
   a. the marginal utilities of the combinations decrease, descending along the curve
   b. combinations are equally preferred to one another
   c. the marginal utilities of the combinations increase, descending along the curve
   d. each combination matches its price
   e. they lie on a straight line

2. A budget line
   a. represents the total value of all combinations on an indifference curve
   b. is determined by a set of prices, indicating combinations of goods a consumer can buy with given income
   c. is derived by consumers to fix the combinations of goods they can buy and how much they can save
   d. is an equation representing what a consumer would buy if income matched prices
   e. curves inward (is concave) to the origin.

3. The indifference curve approach to demand derivation is based on
   a. precise comparisons of measurements of utility levels from the consumption of sets of goods
   b. a recent invention called the utilometer
   c. interpersonal comparisons of utility
   d. the fact that the marginal utility of money is diminishing
   e. consumer preferences between sets of goods

4. Indifference curves that are downward sloping and convex to the origin reflect
   a. the abandonment of utility theory with the indifference curve approach
   b. the increasing marginal utility of certain goods
   c. the increasing ease of substituting one good for another
   d. the declining marginal rate of substitution
   e. the rising marginal rate of substitution
5. Suppose a consumer, with an income of $100, faces a $1 price for soda and a $2 price for hot dogs. The consumer's budget line will intersect the hot dog and soda axes at
   a. 100 hot dogs and 50 sodas
   b. 50 hot dogs and 100 sodas
   c. 100 hot dogs and 200 sodas
   d. 75 hot dogs and 150 sodas
   e. points that cannot be determined without an indifference map

6. Given the information in question 6, suppose that the price of hot dogs increases to $4 each. This price increase would result in all of the following except
   a. a change in the soda intercept
   b. a decrease in the maximum number of hot dogs that can be purchased
   c. a shift to an indifference curve corresponding to a lower utility level for the consumer
   d. a possible decrease in soda consumption since hot dogs and sodas are complementary goods
   e. a nonparallel shift in the budget constraint toward the origin

7. Suppose the consumer's income in questions 5 and 6 increases to $200. If the prices of sodas and hot dogs are $1 and $2, respectively, the increase in income would result in all of the following except
   a. a doubling of each intercept to the axes for sodas and hot dogs
   b. a change in the shape of the consumer's indifference curves
   c. a shift to an indifference curve corresponding to a higher utility level for the consumer
   d. a parallel shift in the budget constraint
   e. an increase in either or both soda and hot dog consumption

8. One problem with the marginal-utility-to-price ratio approach to understanding the law of demand is that
   a. it forces us to make interpersonal comparisons of utility
   b. the measurement of utility seems so unrealistic
   c. people find it impossible to rank their preferences
   d. many times, the law of diminishing marginal utility is violated
   e. the theory is useless for the development of tax policies

9. The distinction between an indifference curve and an indifference map is that
   a. an indifference curve allows utility levels to fluctuate while utility is constant on an indifference map
   b. indifference curves are convex toward the origin while indifference maps are concave
   c. an indifference map is comprised of many indifference curves
   d. an indifference map has a rising marginal rate of substitution
   e. the law of diminishing marginal utility is less evident in an indifference map than on an indifference curve

10. A demand curve that is derived using the indifference curve approach will
    a. be more sensitive to income changes than one derived using the marginal-utility-to-price ratio approach
    b. have the same characteristics as one derived using the marginal-utility-to-price ratio approach
    c. allow for interpersonal comparisons of utility to be made with precision
    d. show a declining marginal rate of substitution
    e. be more likely to have a positive slope than one derived using the marginal-utility-to-price ratio approach

Discussion Questions

1. What motivated economists to develop the indifference curve approach to the derivation of demand curves? What is required of consumers in order for this approach to be feasible?
2. Why do indifference curves show a declining marginal rate of substitution?

3. Why are total utility levels for indifference curves that lie farther from the origin higher than total utility levels for indifference curves close to the origin?

4. Explain how it is possible to derive a demand curve given a consumer’s indifference curves and budget lines that reflect changes in the price of one good, holding income constant.
Problems

1. Bill is a big Widespread Panic fan. He follows the band from show to show and tapes each concert. Bill is indifferent between the following combinations of tickets to Widespread Panic shows and cases of cassette tapes (Bill is Old School).

<table>
<thead>
<tr>
<th>Tickets</th>
<th>Cases of Tapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

a. Sketch Bill’s indifference curve below with tickets on the horizontal axis and cases of tapes on the vertical axis. Does this curve show the declining marginal rate of substitution? Carefully explain why.

b. Draw another indifference curve on the same set of axes you used above that shows Bill’s preferences for the following pairs of points.

<table>
<thead>
<tr>
<th>Tickets</th>
<th>Cases of Tapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

Which set of combinations of tickets and tapes does Bill prefer and why?

c. Suppose that the tickets to shows and the cases of tapes are priced at $20 each. If Bill has $240 to spend, what is the maximum number of shows that he can see? What is the maximum number of cases of tapes that he can purchase? Use these values to draw in Bill’s budget line on the axes you drew for part a.

d. How many shows will Bill see and how many cases of tapes will he buy? How do you know?
e. Suppose that the price of cases of tapes falls to $10. Draw Bill’s new budget line. How many cases will he buy and how many shows will he see now?

f. What is the quantity demanded of cases of tapes when the price is $20 per case? $10 per case? Sketch Bill’s demand curve for cases of tapes.

Answers to Questions for the Appendix

True-False Questions

1. True
2. False. Utility is constant along an indifference curve so it cannot increase as Ian moves down along the curve.
3. True
4. True
5. False. The marginal rate of substitution is the rate at which one good can be substituted for another holding the level of utility constant (as along an indifference curve). However, the marginal rate of substitution is not constant along an indifference curve. The marginal rate of substitution declines along an indifference curve because of the law of diminishing marginal utility. As equal amounts of one good are sacrificed, larger amounts of the second good are required to keep utility constant.
6. True
7. True
8. True
9. False. In order to derive a demand curve for a good, only that good’s price should be changed while holding income and the prices of other goods constant.
10. False. The indifference curve approach and the marginal-utility-to-price ratio approach to deriving demand curves arrive at the same result. That is, they show downward-sloping demand curves reflecting the law of demand.
Multiple-Choice Questions

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

Discussion Questions

1. Even though the idea of linking the law of demand to the law of diminishing marginal utility by comparing the choices consumers make as price changes alter marginal-utility-to-price ratios makes perfectly good sense, it depends on the notion of measuring utility. The measurement is done in hypothetical units called utils. Therefore, economists have developed an alternative method for deriving demand curves that gets the same result. This is the indifference curve approach. All that is required of consumers using the indifference curve approach is that they be able to rate the utilities of sets of goods as greater, less than, or equal to the utilities of other sets of good.

2. Indifference curves are drawn downward sloping and convex to the origin, thus exhibiting the declining marginal rate of substitution. The declining marginal rate of substitution arises from the fact that as the consumption of one good increases by equal amounts, a consumer will accept smaller and smaller sacrifices of the other good, holding utility constant. That is because the consumer experiences the law of diminishing marginal utility as consumption of the one good increases by equal amounts. The diminishing marginal utility is borne out in the smaller and smaller sacrifices of the second good the consumer is willing to accept.

3. It makes sense that utility levels are higher for indifference curves that lie farther from the origin because these curves correspond to the consumption of larger amounts of the two goods represented by an indifference map. As consumption increases, utility levels increase too.

4. The method for deriving a demand curve with indifference curves and budget lines is straightforward. Use the prices of the goods and the consumer’s income to determine the endpoints of the budget line on the axes for the two goods. This is done by dividing the income by the price of each good to find out the maximum amount of each good the consumer could buy if only that good was purchased. Connect the two endpoints to form the budget line. Then find the tangent point of the budget line to the consumer’s highest indifference curve. This is the utility-maximizing combination of the two goods given the prices and incomes. Now, let one of the good’s prices decrease by some amount. Find the new endpoint for the line by dividing income by the new price. The new line will be tangent to an indifference curve that lies farther from the origin than did the first one. Record the prices and quantities consumed at each price. Plot these prices and quantities demanded to draw a demand curve. You’ve done it!

Problems

1. a. This curve does show the declining marginal rate of substitution. Moving from 16 cases of tapes to 8, Bill receives 2 additional tickets for a marginal rate of substitution equal to \(-8/2\) or \(-4\). From 8 cases of tapes to 4, Bill gets 2 more tickets for a marginal rate of substitution equal to \(-2\). From 4 cases of tapes to 2, Bill acquires two more tickets for a marginal rate of substitution equal to \(-1\). He gives up fewer and fewer cases of tapes to obtain 2 additional tickets. So, the marginal rate of substitution is declining.
b. The second indifference curve is farther from the origin and shows a higher utility level so it is preferred to the first set of combinations of tickets and tapes. This makes sense because each level of ticket consumption is matched with a bigger level of tape consumption in the second set of combinations.

c. With $240, Bill can see a maximum of 12 shows at $20 per show. He could also purchase a maximum of 12 cases of tapes.

d. Bill will purchase 8 tickets, so he’ll see 8 shows and buy 4 cases of tapes. These quantities correspond to the tangent point between the budget line and the indifference curve.

e. The new budget line cuts the cases of tapes axis at 24. Bill will now go to 6 shows and purchase 12 cases of tapes. These combinations of tickets and tapes correspond to the tangent point of the budget line to the higher indifference curve.

f. At $20 per case, Bill purchases 4 cases of tapes. At $10 per case, Bill buys 12 cases of tapes. These price and quantity demanded combinations yield a typical downward-sloping demand curve when they are graphed.
**Homework Questions**

**True-False Questions** — If a statement is false, explain why.

1. Diminishing marginal utility means that as more of a good is consumed, the addition to total utility from additional consumption eventually declines. (T/F)

2. If the marginal-utility-to-price ratio for bananas is greater than for oranges more oranges should be consumed. (T/F)

3. Even though utility cannot be compared between people, it is reasonable to believe that for rich people, the marginal utility of additional income is less than for poor people. (T/F)

4. As the price of a good decreases, its marginal-utility-to-price ratio increases, so consumers purchase more. (T/F)

5. Although consumers usually pay prices read from their demand curves, they still enjoy consumer surplus. (T/F)

**Multiple-Choice Questions**

1. If a consumer derives less utility from each additional unit consumed, then
   a. no consumer surplus is enjoyed
   b. total utility is declining
   c. marginal utility will increase
   d. the law of diminishing marginal utility applies
   e. interpersonal comparisons of utility are meaningful

2. A total utility curve that has a positive slope but flattens out as more is consumed will
   a. not reflect the law of diminishing marginal utility
   b. have a marginal utility curve that is upward sloping
   c. eventually get steeper
   d. have a marginal utility curve that is downward sloping
   e. eventually have a negative slope

3. One effect of an increase in the price of gasoline would be to
   a. decrease the demand for fuel efficient cars
   b. decrease consumer surplus
   c. discourage exploration for more oil
   d. decrease the quantity of gasoline supplied
   e. discourage research into alternative energy sources
4. Assuming no change in a person’s tastes, a decrease in the marginal-utility-to-price ratio for a good the person consumes must be the result of a(n)
   a. increase in the price of the good
   b. increase in the price of a substitute good
   c. increase in income
   d. decrease in the price of the good
   e. decrease in the price of a complementary good

5. If one accepts that interpersonal comparisons of utility are reasonable and that there is diminishing marginal utility of money, then
   a. the poor should be taxed at a higher rate than the rich
   b. government policy favoring a more equitable distribution of income seems appropriate
   c. the rich get more enjoyment from their last dollar of income than do the poor
   d. income taxes should be abolished
   e. welfare should be abolished

Discussion Questions/Problems

1. Why do stores run sales where consumers are encouraged to buy the first unit of a good and get the second unit at half of the regular price? (Hint: Think about marginal-utility-to-price ratios.)

2. Suppose the following chart represents the marginal utilities in utils that you derive from consuming pizza, soda, and ice cream. The prices are: pizza = $3, soda = $2, ice cream = $1. If you had a $20 budget, how much of each good would you buy?

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Pizza</th>
<th>Soda</th>
<th>Ice Cream</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
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<td>5</td>
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