## ANSWERS TO END-OF-CHAPTER QUESTIONS

21-1 Explain the law of demand through the income and substitution effects, using a price increase as a point of departure for your discussion. Explain the law of demand in terms of diminishing marginal utility.

When the price of a good rises, the real income of those who demand it is reduced; they now can buy less of this good (and of all other commodities). The second reason for buying less of the good whose price has risen is that it has become more expensive in relation to substitute goods. People will, therefore, substitute the now relatively cheaper goods for the one whose price has risen. For these two reasons— a decrease in real income and the now relatively higher price of the good in question—people buy less of a good when its price rises.

This reasoning also works in reverse; people's real income rises when the price of a good drops and they tend to substitute it for other goods whose prices have not changed. This is the law of demand: People tend to buy more of a commodity as its price drops.

As people acquire more and more of any commodity, eventually their desire for yet more of it decreases. In other words, the extra or marginal utility they derive from additional units of the commodity decreases. This being so, people can only be induced to buy more and more of a commodity if its price gets progressively less.

21-2 (*Key Question*) Complete the following table and answer the questions below:

| Units consumed | Total utility | Marginal utility |
|---|---|---|
| **0** | **0** | **___** |
| **1** | **10** | **10** |
| **2** | **__18_** | **8** |
| **3** | **25** | **__7_** |
| **4** | **30** | **__5_** |
| **5** | **__33_** | **3** |
| **6** | **34** | **__1_** |

a. At which rate is total utility increasing: a constant rate, a decreasing rate, or an increasing rate? How do you know?

b. "A rational consumer will purchase only 1 unit of the product represented by these data, since that amount maximizes marginal utility." Do you agree? Explain why or why not.

c. "It is possible that a rational consumer will not purchase any units of the product represented by these data." Do you agree? Explain why or why not.

Missing total utility data top – bottom: 18; 33. Missing marginal utility data, top – bottom: 7; 5; 1.

(a) A decreasing rate; because marginal utility is declining.

(b) Disagree. The marginal utility of a unit beyond the first may be sufficiently great (relative to product price) to make it a worthwhile purchase.

(c) Agree. This product's price could be so high relative to the first unit's marginal utility that the consumer would buy none of it.

21-3 Mrs. Wilson buys loaves of bread and quarts of milk each week at prices of $1 and 80 cents, respectively. At present she is buying these two products in amounts such that the marginal utilities from the last units purchased of the two products are 80 and 70 utils, respectively. Is she buying the utility-maximizing combination of bread and milk? If not, how should she reallocate her expenditures between the two goods?

Mrs. Wilson is not buying the utility-maximizing combination of bread and milk since the marginal utility per cent spent on each good is not equal. The marginal utility per cent of bread is 0.8 (= 80 utils/100 cents); the utility per cent of milk is 0.875 (= 70 utils/80 cents). Mrs. Wilson should buy more milk and less bread.

21-4 (*Key Question*) Columns 1 through 4 of the accompanying table show the marginal utility, measured in terms of utils, which Ricardo would get by purchasing various amounts of products A, B, C, and D. Column 5 shows the marginal utility Ricardo gets from saving. Assume that the prices of A, B, C, and D are $18, $6, $4, and $24, respectively, and that Ricardo has a money income of $106.

| **Column 1** | | | **Column 2** | | | **Column 3** | | | **Column 4** | | | **Column 5** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Units of A** | **MU** | **MU/$18** | **Units of B** | **MU** | **MU/$6** | **Units of C** | **MU** | **MU/$4** | **Units of D** | **MU** | **MU/$24** | **No. of $ saved** | **MU** | **MU/$1** |
| **1** | **72** | **4** | **1** | **24** | **4** | **1** | **15** | **3.75** | **1** | **36** | **1.5** | **1** | **5** | **5** |
| **2** | **54** | **3** | **2** | **15** | **2.5** | **2** | **12** | **3** | **2** | **30** | **1.25** | **2** | **4** | **4** |
| **3** | **45** | **2.5** | **3** | **12** | **2** | **3** | **8** | **2** | **3** | **24** | **1** | **3** | **3** | **3** |
| **4** | **36** | **2** | **4** | **9** | **1.5** | **4** | **7** | **1.75** | **4** | **18** | **0.75** | **4** | **2** | **2** |
| **5** | **27** | **1.5** | **5** | **7** | **1.16** | **5** | **5** | **1.25** | **5** | **13** | **0.54** | **5** | **1** | **1** |
| **6** | **18** | **1** | **6** | **5** | **0.83** | **6** | **4** | **1** | **6** | **7** | **0.29** | **6** | **1/2** | **1/2** |
| **7** | **15** | **0.83** | **7** | **2** | **0.33** | **7** | **3.5** | **0.87** | **7** | **4** | **0.16** | **7** | **1/4** | **1/4** |
| **8** | **12** | **0.66** | **8** | **1** | **0.16** | **8** | **3** | **0.75** | **8** | **2** | **0.08** | **8** | **1/8** | **1/8** |

a. What quantities of A, B, C, and D will Ricardo purchase in maximizing his utility?

b. How many dollars will Ricardo choose to save?

c. Check your answers by substituting them into the algebraic statement of the utility-maximizing rule.

(a) Calculate the MU/P AS SHOWN IN TABLE ABOVE.

Then follow the logic of Table 21.2:

| choice No | potential choices | MU/P | DECISION | LEFT OVER INCOME |
|---|---|---|---|---|
| | | | BUY FIRST UNIT OF A AND B | |
| 1 | FIRST UNIT OF A | 4 | (The individual is indifferent between A and B so buys both) | 82 |
| | FIRST UNIT OF B | 4 | | |
| | FIRST UNIT OF C | 3.7 | | |
| | FIRST UNIT OF D | 1.5 | | |
| | | | BUY FIRST UNIT OF C | |
| 2 | SECOND UNIT OF A | 3 | The first unit of Option C yields the highest MU/P) | 78 |
| | SECOND UNIT OF B | 2.5 | | |
| | FIRST UNIT OF C | 3.7 | | |
| | FIRST UNIT OF D | 1.5 | | |
| 3 | SECOND UNIT OF A | 3 | BUY SECOND UNIT OF A AND C | 56 |
| | SECOND UNIT OF B | 2.5 | | |
| | SECOND UNIT OF C | 3 | | |
| | FIRST UNIT OF D | 1.5 | | |
| 4 | THIRD UNIT OF A | 2.5 | BUY THIRD UNIT OF A AND SECOND OF B | 32 |
| | SECOND UNIT OF B | 2.5 | | |
| | THIRD UNIT OF C | 2 | | |
| | FIRST UNIT OF D | 1.5 | | |
| 5 | FOURTH UNIT OF A | 2 | BUY FOURTH UNIT OF A, THIRD UNIT OF B AND C | 4 |
| | THIRD UNIT OF B | 2 | | |
| | THIRD UNIT OF C | 2 | | |
| | FIRST UNIT OF D | 1.5 | | |

Hence consumer equilibrium is reached (i.e. MU/P are equalized) at 4 units of A; 3 units of B; 3 units of C, and 0 units of D

(b) Save \$4. The individual could use the \$4 to buy an extra unit of C but the MU/P of doing so would be lower than if it were saved (i.e. 1.7<2)

(c) 36/\$18 = 12/\$6 = 8/\$4 = 2/\$1. The marginal utility per dollar of the last unit of each product purchased is 2.

21-5 (*Key Question*) You are choosing between two goods, X and Y, and your marginal utility from each is as shown below. If your income is $9 and the prices of X and Y are $2 and $1, respectively, what quantities of each will you purchase in maximizing utility? What total utility will you realize? Assume that, other things remaining unchanged, the price of X falls to $1. What quantities of X and Y will you now purchase? Using the two prices and quantities for X, derive a demand schedule (price-quantity-demanded table) for X.

| Units of X | $MU_x$ | Units of Y | $MU_y$ |
|---|---|---|---|
| **1** | **10** | **1** | **8** |
| **2** | **8** | **2** | **7** |
| **3** | **6** | **3** | **6** |
| **4** | **4** | **4** | **5** |
| **5** | **3** | **5** | **4** |
| **6** | **2** | **6** | **3** |

Buy 2 units of X and 5 units of Y. Marginal utility of last dollar spent will be equal at 4 (= 8/$2 for X and 4/$1 for Y) and the $9 income will be spent. Total utility = 48 (= 10 + 8 for X plus 8 + 7 + 6 + 5 + 4 for Y). When the price of X falls to $1, the quantity of X demanded increases from 2 to 4. Total utility is now 58 (= 10 + 8 + 6 + 4 for X plus 8 + 7 + 6 + 5 + 4 for Y).

Demand schedule: $P$ = $2; $Q$ = 2. $P$ = $1; $Q$ = 4.

21-6 How can time be incorporated into the theory of consumer behavior? Explain the following comment: "Want to make a million dollars? Devise a product that saves Americans time."

Time is money. This expression is a time-saving way of making the point that for a person who can make so much per hour, every hour spent not working is so much money not made. A person can be said to "consume" a ball game or an evening at the theater. If the ball game costs $10 and the theater $20, at first sight one could say the ball game is a better deal. But if the person makes $20 an hour and is forgoing this in taking the time off, then we must take into account the time spent at the ball game and at the theater. If the ball game goes into extra innings and takes 4 hours, then its total cost is $90 (= $10 + $80). If the theater takes 3 hours, its total cost is $80 (= $20 + $60). Assuming the marginal utility of the ball game and attending the theater are the same, the theory of consumer behavior (with time taken into account) would therefore have this consumer going to the theater.

A time-saving device would free the individual up to earn more income. As long as the amount of extra income earned is greater than the cost of the device, many Americans will buy the device. For many Americans, what is scarcest in their lives is time.

21-7 Explain:

a. "Before economic growth, there were too few goods; after growth, there is too little time."

b. "It is irrational for an individual to take the time to be completely rational in economic decision making."

c. "Telling Santa what you want for Christmas make sense in terms of utility maximization."

(a) Before economic growth, most people live at the subsistence level. By practically anyone's definition, this implies "too few goods." After economic growth, goods are in relative abundance. To make more takes time, but the relative abundance of goods means that there are already many goods to enjoy. So, now there is a clash between the use of time to make more goods and the use of time to relax and enjoy the goods one already has. There just isn't enough time.

(b) To be completely rational in economic decision making, provided one does not take time into consideration, one has to take account of every factor. This would take a great deal of time. One could not, for example, make any purchase without first searching the classifieds to see whether a better deal could be had, rather than simply heading for the nearest store. However, this would be most irrational, for time does have value. While making an extensive search before making any deal, one would be forgoing the income to make this or any deal. For every penny saved to make the perfect deal, one would be losing dollars in income because of the time spent in making the perfect deal.

(c) There is little time sacrificed in making a request to Santa for a specific item. If one receives it, the benefit will likely exceed the cost.

21-8 In the last decade or so there has been a dramatic expansion of small retail convenience stores (such as Kwik Shops, 7-Elevens, Gas 'N Shops) although their prices are generally much higher than those in the large supermarkets. What explains the success of the convenience stores?

These stores are selling convenience as well as the goods that are purchased there. Because of their small size and convenient locations, they save busy consumers time. In an era when most consumers are working at least 40 hours per week, their time is valuable, and when only a few items are needed, the time saved must be worth the additional cost one pays for shopping at these convenience stores. (You seldom, if ever, see anyone buying a week's worth of groceries at such shops.)

21-9 Many apartment-complex owners are installing water meters for each individual apartment and billing the occupants according to the amount of water they use. This is in contrast to the former procedure of having a central meter for the entire complex and dividing up the water expense as part of the rent. Where individual meters have been installed, water usage has declined 10 to 40 percent. Explain this drop, referring to price and marginal utility.

The way we pay for a good or service can significantly alter the amount purchased. An individual living in an apartment complex who paid a share of the water expense measured by a central meter would have little incentive to conserve. Individual restraint would not have much impact on the total amount of water used.

Suppose there were 10 apartments in the complex, each apartment would be billed for one tenth of the cost of the water. A single gallon of water would carry a price equal to one tenth the amount charged by the water district. The very low price per gallon would encourage the use of water until the marginal utility of an additional gallon was correspondingly low. If the tenants paid separately for their own water, the full market price of water would be considered when making their consumption choices.