Chapter 03 - Demand, Supply, and Market Equilibrium

Questions

1. Explain the law of demand. Why does a demand curve slope downward? How is a market demand curve derived from individual demand curves? **LO1**

   **Answer:** As prices change because of a change in supply for a commodity, buyers will change the quantity they demand of that item. If the price drops, a larger quantity will be demanded. If the price rises, a lesser quantity will be demanded. The demand curve slopes downward because of diminishing marginal utility, and the substitution and income effects. Because successive units of a good provide less additional utility than the previous units, buyers will only pay for these smaller amounts of utility if the price is lowered. When the price of a commodity decreases relative to that of substitutes, a buyer will substitute the now cheaper commodity for those whose prices have not changed. At the same time, the decreased price of the commodity under discussion will make the buyer wealthier in real terms. More can be bought of this commodity (as well as of others whose prices have not changed). Thus, the substitution and income effects reinforce each other: More will be bought of a normal (or superior) commodity as its price decreases. On a graph with price on the vertical axis and quantity on the horizontal, this is shown as a demand curve sloping downward from left to right.

2. What are the determinants of demand? What happens to the demand curve when any of these determinants change? Distinguish between a change in demand and a movement along a fixed demand curve, noting the cause(s) of each. **LO1**

   **Answer:** The fundamental determinant of demand is the price of the commodity under consideration: a change in price causes movement along the commodity’s demand curve. This movement is called a change in quantity demanded. Decreased price leads to movement down the demand curve: There is an increase in quantity demanded. Increased price leads to movement up the demand curve: There is a decrease in quantity demanded. In addition, there are determinants of demand, which are factors that may shift the demand curve, i.e., cause a “change in demand.” These are the number of buyers, the tastes (or desire) of the buyers for the commodity, the income of the buyers, the changes in price of related commodities (substitutes and complements), and expectations of the buyers regarding the future price of the commodity under discussion. The following will lead to increased demand: more buyers, greater desire for the commodity, higher incomes (assuming a normal good), lower incomes (assuming an inferior good), an increased price of substitutes, a decreased price of complements, and an expectation of higher future prices or incomes. This increased demand will show as a shift of the entire demand curve to the right.
3. What effect will each of the following have on the demand for small automobiles such as the Mini-Cooper and Smart car? **LO1**
   a. Small automobiles become more fashionable.
   b. The price of large automobiles rises (with the price of small autos remaining the same).
   c. Income declines and small autos are an inferior good.
   d. Consumers anticipate that the price of small autos will greatly come down in the near future.
   e. The price of gasoline substantially drops.

   **Answer:** Demand increases in (a), (b), and (c); decreases in (d). The last one (e) is ambiguous. As autos and gas are complements, one could argue that the decrease in gas prices would stimulate demand for all cars, including small ones. However, one could also argue that small cars are attractive to consumers because of fuel efficiency, and that a decrease in gas prices effectively reduces the price of the “gas guzzling” substitutes. That would encourage consumers to switch from smaller to larger cars (SUVs), and demand for small automobiles would fall. This presents a good illustration of the complexity of many of these changes.

4. Explain the law of supply. Why does the supply curve slope upward? How is the market supply curve derived from the supply curves of individual producers? **LO2**

   **Answer:** As prices rise because of increased demand for a commodity, producers find it more and more profitable to increase the quantity they offer for sale; that is, the supply curve will slope upward from left to right. Clearly, firms would rather sell at a higher price than at a lower price. Moreover, it is necessary for firms to demand a higher price as they increase production. This comes about because as they produce more and more, they start to run up against capacity constraints and costs rise. At any given time, a plant has a given size. As production increases, the firm will need to add an extra shift and then a third shift, both perhaps at higher wages. It may run out of warehouse space and have to rent at higher cost from another firm. It may have to pay extra to get increasingly urgent raw material, and so on.

   The market supply curve is derived by horizontally adding the individual supply curves.

5. What are the determinants of supply? What happens to the supply curve when any of these determinants changes? Distinguish between a change in supply and a change in the quantity supplied, noting the cause(s) of each. **LO2**

   **Answer:** The fundamental determinant of supply is the price of the commodity. As price increases, the quantity supplied increases. An increase in price causes a movement up a given supply curve. A decrease in price causes a movement down a given supply curve.

   The non-price determinants of supply are: resource (input) prices, technology, taxes and subsidies, prices of other related goods, expectations, and the number of sellers. If one or more of these change, there will be a change in supply and the whole supply curve will shift to the right or the left.
The following will cause an increase in supply: a decrease in resource (input) prices; improved (lower cost) technology; a decrease in business taxes, an increase in subsidies to business; a decrease in the price of another commodity that this firm was making, provided that commodity is a substitute in production (the firm can switch from the now lower priced one to our commodity); an expectation of lower prices in the future; and an increase in the number of sellers. The increase in supply caused by the noted change in one or more of the above will cause the entire supply curve to shift to the right. More will now be supplied at any given price. Alternatively expressed, any given amount will now be supplied at a lower price.

The reverse of any or all the above changes in the determinants of demand will cause a decrease in demand and will be shown as a shift of the supply curve to the left. Less will now be supplied at any given price. Alternatively expressed, any given amount will now be supplied at a higher price.

6. What effect will each of the following have on the supply of auto tires? LO2
   a. A technological advance in the methods of producing tires.
   b. A decline in the number of firms in the tire industry.
   c. An increase in the prices of rubber used in the production of tires.
   d. The expectation that the equilibrium price of auto tires will be lower in the future than currently.
   e. A decline in the price of the large tires used for semi trucks and earth-hauling rigs (with no change in the price of auto tires).
   f. The levying of a per-unit tax on each auto tire sold.
   g. The granting of a 50-cent-per-unit subsidy for each auto tire produced.

   Answer:
   Part a: Supply will increase because the technological advance allows the tire manufacturers to produce more tires using the same amount of inputs.

   Part b: Supply will decrease because there are less firms in the industry.

   Part c: Supply will decrease because the increase in the price of rubber results in an increase in production costs. Thus, each firm will need to charge a higher price at each level of output (or supply less at each price).

   Part d: Supply will increase because the expectation that the equilibrium price of auto tires will be lower in the future causes firms to sell their inventories today while the price is still high.

   Part e: Supply will increase because the decline in the price of large tires used for semi trucks and earth-hauling rigs (with no change in the price of auto tires) will cause firms to reduce production of large tires (now commanding a lower price) and produce more auto tires.

   Part f: Supply will decrease because per-unit tax on each auto tire sold increases the cost of production since the tire manufacturers must now pay for input costs PLUS the per unit tax.
Part g: Supply will increase because the 50-cent-per-unit subsidy decreases the cost of production. The tire manufacturers receive the subsidy, which they can subtract from their input costs.

7. “In the corn market, demand often exceeds supply and supply sometimes exceeds demand.” “The price of corn rises and falls in response to changes in supply and demand.” In which of these two statements are the terms “supply” and “demand” used correctly? Explain. LO2

Answer: In the first statement “supply” and “demand” are used incorrectly. Supply and demand are both schedules or curves that intersect where quantity supplied and quantity demanded are equal. One cannot talk of curves that intersect as exceeding or not exceeding each other.

Supply and/or demand can change (the entire curves can shift). Each time this happens, it will create a new intersection of the two curves that will lead to changes in the equilibrium quantity and price of corn. Thus, the terms “supply” and “demand” are used correctly in the second statement.

8. In 2001 an outbreak of foot-and-mouth disease in Europe led to the burning of millions of cattle carcasses. What impact do you think this had on the supply of cattle hides, hide prices, the supply of leather goods, and the price of leather goods? LO4

Answer: The supply of cattle hides was reduced, raising the price of hides. Because hides were more expensive, it became more costly to produce leather, reducing the supply and raising the price of leather goods.

9. Critically evaluate: “In comparing the two equilibrium positions in Figure 3.7b, I note that a smaller amount is actually demanded at a lower price. This refutes the law of demand.” LO4

Answer: The key point here is that the second equilibrium occurs after demand has decreased, that is demand has shifted because of a change in determinants, which has caused buyers to want less at every price compared to the original D1 demand curve and schedule. Each equilibrium price refers to a different demand situation. Therefore, the fact that less is purchased at a lower price when demand decreases does not refute the law of demand. Note that on the second demand curve and schedule, less would still be purchased at a higher price.
10. For each stock in the stock market, the number of shares sold daily equals the number of shares purchased. That is, the quantity of each firm’s shares demanded equals the quantity supplied. So, if this equality always occurs, why do the prices of stock shares ever change? **LO4**

**Answer:** During any given stock trading session, there will be both prospective buyers and sellers, each willing to buy or sell a certain number of shares depending on price. If at the current price (e.g. the day’s opening price) the quantity of shares demanded exceeds the quantity of shares supplied, buyers must increase their price offers to induce sellers to offer enough shares. This will cause share prices to rise until quantity demanded equals quantity supplied. Suppose that during the trading session there is a report of bad economic news. Sellers may respond by trying to sell more shares than buyers are wanting at the current price. In order to find enough willing buyers, sellers will have to offer their shares at lower prices. On any given trading day, there will be multiple equilibrium prices, many of them not lasting for more than a few minutes (or even seconds).

11. Suppose the total demand for wheat and the total supply of wheat per month in the Kansas City grain market are as shown in the nearby table. Suppose that the government establishes a price ceiling of $3.70 for wheat. What might prompt the government to establish this price ceiling? Explain carefully the main effects. Demonstrate your answer graphically. Next, suppose that the government establishes a price floor of $4.60 for wheat. What will be the main effects of this price floor? Demonstrate your answer graphically. **LO5**

<table>
<thead>
<tr>
<th>Thousands of Bushels Demanded</th>
<th>Price per Bushel</th>
<th>Thousands of Bushels Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>$3.40</td>
<td>72</td>
</tr>
<tr>
<td>80</td>
<td>3.70</td>
<td>73</td>
</tr>
<tr>
<td>75</td>
<td>4.00</td>
<td>75</td>
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<tr>
<td>70</td>
<td>4.30</td>
<td>77</td>
</tr>
<tr>
<td>65</td>
<td>4.60</td>
<td>79</td>
</tr>
<tr>
<td>60</td>
<td>4.90</td>
<td>81</td>
</tr>
</tbody>
</table>

**Answer:** The equilibrium price is found where quantity supplied equals quantity demanded. This occurs at the price of $4.00 where 75 thousand bushels are demanded and 75 thousand bushels are supplied (equilibrium quantity).

If the government establishes a price ceiling at $3.70 (sellers cannot charge a price above $3.70), there will be an excess demand of 7 thousand bushels. Buyers demand 80 thousand bushels at the price of $3.70, but sellers only supply 73 thousand bushels.
If the government establishes a price floor at $4.60 (sellers cannot charge a price below $4.60), there will be an excess supply of 14 thousand bushels. Buyers demand 65 thousand bushels at the price of $4.60, but sellers supply 79 thousand bushels.

12. What do economists mean when they say “price floors and ceilings stifle the rationing function of prices and distort resource allocation”? **LO5**

**Answer:** When unrestrained, prices rise and fall to correct imbalances between the quantity supplied and quantity demanded in a market. If sellers find themselves at a given price with more output than consumers are willing to purchase, the price will fall. Likewise, if the market is not offering enough of a good to satisfy consumer demand, the price will rise. Price floors and ceilings prevent price movements to correct these imbalances. When a price is set above equilibrium (i.e. a price floor), sellers will produce more than the market can support, diverting resources away from more highly valued uses. Price ceilings result in an underallocation of resources toward a particular good, where the excess demand (shortage) reveals that consumers value the good (and therefore the resources used to produce it) more than what the market currently offers.
13. **LAST WORD** In some countries, such as France, every corpse is available for doctors to “harvest” for organs unless the deceased, while still alive, signed a form forbidding the organs to be harvested. In the USA, it is the opposite: No harvesting is allowed unless the deceased had signed, while still alive, an organ donor form authorizing doctors to harvest any needed organs. Use supply and demand figures to show in which country organ shortages are likely to be less severe.

**Answer:** In France every corpse is available for doctors to “harvest” for organs unless the person signed a form while he was still alive, forbidding his organs to be harvested. Evidence from behavioral economics suggests that people are more likely to opt into the default program, which in the case of France is donating organs. There may still be a shortage at a zero price (donated organs), but it will more than likely be less than the shortage in U.S. where the default program not to donate organs (must opt into the donation program).

Graphically, we first look at the U.S. case where individuals must opt into the program of donation (default is to opt out). Here the shortage at the zero price is the distance ($Q_1 - Q_3$). This may be large because people do not choose to donate.

We can also look at the graph for France. Here the default program is to donate organs (must choose to opt out). This implies there will likely be a greater fixed supply of organs at the zero price. In this case the shortage, or the distance ($Q_1 - Q_3$), at the zero price is likely to be smaller in France because people in France must instruct the doctors not to harvest organs.
Problems

1. Suppose there are three buyers of candy in a market: Tex, Dex, and Rex. The market demand and the individual demands of Tex, Dex, and Rex for candy are given in the table below. LO1

a. Fill in the table for the missing values.

b. Which buyer demands the least at a price of $5? The most at a price of $7?

c. Which buyer’s quantity demanded increases the most when the price is lowered from $7 to $6?

d. Which direction would the market demand curve shift if Tex withdrew from the market? What if Dex doubled his purchases at each possible price?

e. Suppose that at a price of $6, the total quantity demanded increases from 19 to 38. Is this a “change in the quantity demanded” or a “change in demand”?

<table>
<thead>
<tr>
<th>Price per Candy</th>
<th>Individual Quantities Demanded</th>
<th>Total Quantity Demanded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tex</td>
<td>Dex</td>
</tr>
<tr>
<td>$8</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>___</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>___</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>5</td>
</tr>
</tbody>
</table>

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Answers: (a) Row 1: 4; Row 2: 2; Row 3: 12; Row 4: 4; Row 5: 36. (b) Dex, Tex. (c) Tex. (d) Left, Right. (e) “A change in demand.”

Feedback: Consider the following set of values:

Part a: At each price (row) the total quantity demanded will equal the sum of the individual quantities demanded. To find the total quantity demanded at the price of $8 add the quantities demanded by Tex, Dex, and Rex, which equals 4 (= 3 + 1 + 0). To find Rex's quantity demanded at the price of $7, we use the same logic as above. The sum of the individual quantities demanded equals 12 (total quantity demanded). We also know that the sum for Tex and Dex equals 10 (= 8 + 2). This implies Rex's quantity demanded at $7 must equal 2 (= 12 (Total) - 8 (Tex) - 2 (Dex)). The same algorithm can be applied to the other rows. At $6 the quantity demanded by Tex equals 12 (= 19 - 3 - 4). At $5 the quantity demanded by Dex equals 4 (= 27 - 17 - 6). At the price of $4 the total quantity demanded equals 36 (= 23 + 5 + 8).

Part b: At a price of $5 Dex demands the least amount of goods, which equals 4. Tex demands 17, and Rex demands 6. At a price of $7 Tex demands the most amount of goods, which equals 8. Dex demands 2, and Rex demands 2.

Part c: When the price is lowered from $7 to $6, Tex's demand increases by 4 (= 12 - 8), Dex's demand increases by 1 (= 3 - 2), and Rex's demand increases by 2 (= 4 - 2). Thus, Tex's demand increases the most when the price is lowered from $7 to $6.

Part d: If Tex withdraws from the market, there would be less demand at every price level. This implies that the demand schedule would shift to the left. If Dex doubled his purchases at every price level, this would increase demand. This implies that the demand schedule would shift to the right.

Part e: Since the price is fixed in the statement, this is a change in demand. A change in the quantity demanded results from a change in price.

2. The figure below shows the supply curve for tennis balls, $S_1$, for Drop Volley tennis, a producer of tennis equipment. Use the figure and the table below to give your answers to the following questions. LO2
a. Use the figure to fill in the quantity supplied on supply curve $S_1$ for each price in the table below.

<table>
<thead>
<tr>
<th>Price</th>
<th>$S_1$ Quantity Supplied</th>
<th>$S_2$ Quantity Supplied</th>
<th>Change in Quantity Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1$</td>
<td></td>
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</tbody>
</table>

b. If production costs were to increase, the quantities supplied at each price would be as shown by the third column of the table ("$S_2$ Quantity Supplied"). Use that data to draw supply curve $S_2$ on the same graph as supply curve $S_1$.

c. In the fourth column of the table, enter the amount by which the quantity supplied at each price changes due to the increase in product costs. (Use positive numbers for increases and negative numbers for decreases.)

d. Did the increase in production costs cause a “decrease in supply” or a “decrease in quantity supplied”?

Answers: (a) 15 balls at $3; 10 balls at $2, 5 balls at $1; (b) Draw in supply curve $S_2$ using the data in column 3; (c) -11 balls at $3; -8 balls at $2; -5 balls at $1; (d) decrease in supply.

Feedback: Consider the following figure and values.
Part a: The quantity supplied is 15 at $3, 10 at $2, and 5 at $1. This is found by reading the values of the supply curve.

Part b: Graph

Part c: The increase in production costs cause supply to decrease at each price level. Supply falls from 15 to 4 for at the price of $3, thus the change is -11. Supply falls from 10 to 2 at the price of $2, thus the change is -8. Supply falls from 5 to 0 at the price of $1, thus the change is -5.

Part d: This is a decrease in supply because the schedule shifts left (less quantity supplied at every price).

3. Refer to the expanded table below from question 11. **LO3**

<table>
<thead>
<tr>
<th>Thousands of Bushels Demanded</th>
<th>Price per Bushel</th>
<th>Thousands of Bushels Supplied</th>
<th>Surplus (+) or Shortage (−)</th>
</tr>
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<tr>
<td>85</td>
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a. What is the equilibrium price? At what price is there neither a shortage nor a surplus? Fill in the surplus-shortage column and use it to confirm your answers.
b. Graph the demand for wheat and the supply of wheat. Be sure to label the axes of your graph correctly. Label equilibrium price \( P \) and equilibrium quantity \( Q \).
c. How big is the surplus or shortage at $3.40? At $4.90? How big a surplus or shortage results if the price is 60 cents higher than the equilibrium price? 30 cents lower than the equilibrium price?
Answers:
(a) Equilibrium price = $4.00. There is neither a shortage nor a surplus at $4.00. Quantity demanded and quantity supplied are equal to each other when price is $4.00.
(b)

(c) At $3.40, there is a shortage of 13 units (i.e., -13). At $4.90, there is a surplus of 21 units (i.e. +21). If the price increases by 60 cents from the equilibrium price, a surplus of 14 units (+14) results. If the price falls by 30 cents from the equilibrium price, a shortage of 7 units (-7) results.

Feedback: Consider the following data.

<table>
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</table>

(a) $P_e = 4.00$. Equilibrium occurs where there is neither a shortage nor surplus of wheat. At the immediately lower price of $3.70, there is a shortage of 7,000 bushels. At the immediately higher price of $4.30, there is a surplus of 7,000 bushels. Thus, data from top to bottom in the shortage and surplus column is -13; -7; 0; +7; +14; and +21.
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(b) (c) Note: shortages will be negative and surpluses will be positive. At the price $3.40 there will be a 13,000 bushel shortage ($72,000 - 85,000 = -13,000). At the price of $4.90 there will be a 21,000 bushel surplus ($81,000 - 60,000 = 21,000). At the price of $4.60 (60 cents higher than the equilibrium price) there will be a surplus of 14,000 bushels ($79,000 - 65,000 = 14,000). At the price of $3.70 (30 cents lower than the equilibrium price) there will be a shortage of 7,000 bushels ($73,000 - 80,000 = -7,000).

4. How will each of the following changes in demand and/or supply affect equilibrium price and equilibrium quantity in a competitive market; that is, do price and quantity rise, fall, or remain unchanged, or are the answers indeterminate because they depend on the magnitudes of the shifts? Use supply and demand to verify your answers. LO4
   a. Supply decreases and demand is constant.
   b. Demand decreases and supply is constant.
   c. Supply increases and demand is constant.
   d. Demand increases and supply increases.
   e. Demand increases and supply is constant.
   f. Supply increases and demand decreases.
   g. Demand increases and supply decreases.
   h. Demand decreases and supply decreases.
Answers:
(a) Price up; quantity down;
(b) Price down; quantity down;
(c) Price down; quantity up;
(d) Price indeterminate; quantity up;
(e) Price up; quantity up;
(f) Price down; quantity indeterminate;
(g) Price up, quantity indeterminate;
(h) Price indeterminate and quantity down.

Feedback:
Part a: The decrease in supply with a constant demand results in an increase in equilibrium price and a decrease in equilibrium quantity as shown in the figure below.

Part b: The decrease in demand with a constant supply results in a decrease in equilibrium price and a decrease in equilibrium quantity as shown in the figure below.
Part c: The increase in supply with a constant demand results in a decrease in equilibrium price and an increase in equilibrium quantity as shown in the figure below.

Part d: The increase in supply and the increase in demand unambiguously increases the equilibrium quantity. This is because the increase in supply and the increase in demand both increase the equilibrium quantity. However, the change in equilibrium price is indeterminate because the increase in supply puts downward pressure on the equilibrium price and the increase in demand puts upward pressure on the equilibrium price. The figure below shows these effects when the demand effect dominates.
Part e: The increase in demand with a constant supply results in an increase in equilibrium price and an increase in equilibrium quantity as shown in the figure below.
Part f: The increase in supply and the decrease in demand unambiguously decreases the equilibrium price. This is because the increase in supply and the decrease in demand both put downward pressure on the equilibrium price. However, the change in equilibrium quantity is indeterminate because the increase in supply increases the equilibrium quantity and the decrease in demand decreases the equilibrium quantity. The figure below shows these effects when the supply effect dominates.

Part g: The decrease in supply and the increase in demand unambiguously increases the equilibrium price. This is because the decrease in supply and the increase in demand both put upward pressure on the equilibrium price. However, the change in equilibrium quantity is indeterminate because the decrease in supply decreases the equilibrium quantity and the increase in demand increases the equilibrium quantity. The figure below shows these effects when the demand effect dominates.
Part h: The decrease in supply and the decrease in demand unambiguously decreases the equilibrium quantity. This is because the decrease in supply and the decrease in demand both decrease the equilibrium quantity. However, the change in equilibrium price is indeterminate because the decrease in supply puts upward pressure on the equilibrium price and the decrease in demand puts downward pressure on the equilibrium price. The figure below shows these effects when the supply effect dominates.
5. Use two market diagrams to explain how an increase in state subsidies to public colleges might affect tuition and enrollments in both public and private colleges. LO4

**Answer:** The supply curve of the public colleges shifts to the right, reducing tuition and increasing enrollments. Enrollment demand curve of private colleges shifts to the left because of substitution away from private colleges. (See Figure 3.7c for the effect on public colleges, Figure 3.7b for the impact on private colleges.)

Feedback: Consider the case of subsidies to public colleges. The state subsidies to public colleges shift the supply curve of the public colleges to the right, thus reducing tuition and increasing enrollments in these institutions. The decreased cost of public college education leads to some substitution away from the private colleges, where the enrollment demand curve shifts to the left. The final result is a lower cost of tuition in both public and private colleges. (See Figure 3.7c for the effect on public colleges, Figure 3.7b for the impact on private colleges.)

Now consider a tax on private colleges. This will reduce the supply of private colleges (shift the private college supply schedule to the left). This will increase demand at public colleges (shift the public college demand schedule to the right) as the price at private colleges rise. Thus, we will observe an increase in the price at public colleges as well.

The opposite scenarios, to those discussed above, hold when private colleges are subsidized or public schools are taxed.

6. ADVANCED ANALYSIS Assume that demand for a commodity is represented by the equation \( P = 10 - .2Q_d \) and supply by the equation \( P = 2 + .2Q_s \), where \( Q_d \) and \( Q_s \) are quantity demanded and quantity supplied, respectively, and \( P \) is price. Using the equilibrium condition \( Q_s = Q_d \), solve the equations to determine equilibrium price. Now determine equilibrium quantity. LO4

**Answer:** equilibrium price is \( P = 6 \); equilibrium quantity is \( Q = 20 \)

Feedback: Consider the following equations:
- demand for a commodity is \( P = 10 - .2Q_d \)
- supply of the commodity is \( P = 2 + .2Q_s \)

To solve this system of equations we use the fact that the equilibrium price in both equations must be the same. Therefore we can equate the two (eliminate \( P \) from the system).

This gives us: \( 10 - .2Q_d = 2 + .2Q_s \)

We now use the equilibrium condition for quantity: \( Q_s = Q_d = Q \)

We substitute \( Q \) for \( Q_d \) and \( Q_s \)

This gives us: \( 10 - .2Q = 2 + .2Q \)
Chapter 03 - Demand, Supply, and Market Equilibrium

Solving for \( Q \): \( .2Q + .2Q = 8 \) or \( .4Q = 8 \)

The equilibrium quantity is: \( Q = (8/.4) = 20 \)

To find the equilibrium price we substitute the equilibrium quantity \( Q = 20 \) into either the demand function or supply function.

The demand function \( P = 10 - .2Q = 10 - .2 	imes 20 = 10 - 4 = 6 \)
The supply function \( P = 2 + .2Q = 2 + .2 	imes 20 = 2 + 4 = 6 \)

Obviously the answers are the same; this is the equilibrium price, or \( P = 6 \).

7. Suppose that the demand and supply schedules for rental apartments in the city of Gotham are as given in the table below. \textbf{LO5}

<table>
<thead>
<tr>
<th>Monthly Rent</th>
<th>Apartments Demanded</th>
<th>Apartments Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2500</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>2000</td>
<td>12,500</td>
<td>12,500</td>
</tr>
<tr>
<td>1500</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td>1000</td>
<td>17,500</td>
<td>7500</td>
</tr>
<tr>
<td>500</td>
<td>20,000</td>
<td>5000</td>
</tr>
</tbody>
</table>

a. What is the market equilibrium rental price per month and the market equilibrium number of apartments demanded and supplied?
b. If the local government can enforce a rent-control law that sets the maximum monthly rent at $1500, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?
c. Suppose that a new government is elected that wants to keep out the poor. It declares that the minimum rent that can be charged is $2500 per month. If the government can enforce that price floor, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?
d. Suppose that the government wishes to decrease the market equilibrium monthly rent by increasing the supply of housing. Assuming that demand remains unchanged, by how many units of housing would the government have to increase the supply of housing in order to get the market equilibrium rental price to fall to $1500 per month? To $1000 per month? To $500 per month?

Answers: (a) 12,500 apartments at a rent of $2000 per month; (b) A shortage of 5,000 apartments per month, 10,000 apartments will actually be rented each month; (c) A surplus of 5,000 apartments per month, 10,000 apartments will actually be rented each month; (d) 2,500 more apartments, 5000 more apartments; 7,500 more apartments.
Feedback: Consider the following demand and supply schedules:

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<td>500</td>
<td>20,000</td>
<td>5000</td>
</tr>
</tbody>
</table>

Part a: The market equilibrium price is determined by the relationship quantity supplied equals quantity demanded. Thus, to find the equilibrium price we find the price where the quantities are equal, which occurs at the rent (price) of $2000. The equilibrium quantity at this price is 12,500 apartments.

Part b: If the government imposes a maximum rent of $1500 the quantity of apartments supplied equals 10,000 and the quantity of apartments demanded equals 15,000. Thus, there is a shortage of 5000 apartments (= 15,000 (demand) - 10,000 (supply)). The amount of apartments actually rented will be determined by supply here. There are only 10,000 available for rent, so only 10,000 will be rented.

Part c: If the government imposes a minimum rent of $2500 the quantity of apartments supplied equals 15,000 and the quantity of apartments demanded equals 10,000. Thus, there is a surplus of 5000 apartments (= 15,000 (supply) - 10,000 (demand)). The amount of apartments actually rented will be determined by demand here. There are only 10,000 households that want to rent, so only 10,000 will be rented.

Part d: If the government wants to reduce the market equilibrium rent to $1500 per month the government would need to increase the supply of apartments by 2500 units. To see this, start in equilibrium. Here the equilibrium rent is $2000 and the equilibrium quantity is 12,500 units. If the government adds 2500 units there will now be 15,000 units on the market. The equilibrium price is now $1500 (the rent desired by government) and the equilibrium quantity is 15,000.

If the government wanted to reduce the equilibrium rent to $1000 they would need to add 5000 units. This would result in 17,500 units on the market (12,500 already on the market plus the 5000 new apartments), which has an equilibrium rent of $1000.

If the government wanted to reduce the equilibrium rent to $500 they would need to add 7500 units. This would result in 20,000 units on the market (12,500 already on the market plus the 7500 new apartments), which has an equilibrium rent of $1000.