

****Exercise 1: Supply and Demand****

Consider the market for smartphones. Suppose the demand and supply equations are given by:

Demand: $Q_d = 100 - 2P$

Supply: $Q_s = 20 + 3P$

a) Calculate the equilibrium price and quantity.

b) If the price of smartphones is currently \$40, is there a shortage or surplus in the market? If so, by how much?

****Solution:****

a) To find the equilibrium price and quantity, set the quantity demanded equal to the quantity supplied:

$$Q_d = Q_s$$

$$100 - 2P = 20 + 3P$$

Solving for P:

$$100 - 20 = 2P + 3P$$

$$80 = 5P$$

$$P = 16$$

Substitute $P = 16$ into either the demand or supply equation to find the equilibrium quantity:

$$Q_d = 100 - 2(16) = 100 - 32 = 68$$

b) If the price is \$40, substitute $P = 40$ into the demand and supply equations:

$$\text{Demand: } Q_d = 100 - 2(40) = 100 - 80 = 20$$

$$\text{Supply: } Q_s = 20 + 3(40) = 20 + 120 = 140$$

Since quantity demanded (20) is less than quantity supplied 140, there is a surplus of $140 - 20 = 120$ smartphones in the market.

****Exercise 2: Elasticity****

Suppose the demand for gasoline is given by $Q_d = 100 - 5P$, where Q_d is the quantity demanded and P is the price. The price of gasoline increases from \$2 to \$3.

a) Calculate the price elasticity of demand.

b) Interpret the value of the price elasticity.

****Solution:****

a) The price elasticity of demand E_d is calculated using the formula:

$E_d = \text{\%change in quantity demanded} / \text{\%change in price}$

Given:

Initial price $P_1 = \$2$

Final price $P_2 = \$3$

Initial quantity demanded $Q_{d1} = 100$

Final quantity demanded $Q_{d2} = 100 - 5(3) = 85$

Using the formula:

$\text{\% change in price} = ((P_2 - P_1) / ([P_1 + P_2]/2)) \times 100$

$\text{\% change in quantity demanded} = ((Q_{d2} - Q_{d1}) / ([Q_{d1} + Q_{d2}]/2)) \times 100$

$E_d \approx -44.44$

b) The negative value of price elasticity indicates that gasoline demand is price inelastic. This means that a 1% increase in price leads to a less than 1% decrease in quantity demanded. In this case, the elasticity value of -44.44 suggests that gasoline demand is highly price inelastic, indicating that consumers are not very responsive to changes in gasoline prices.

Sure, here are some additional exercises on introductory economics:

****Exercise 3: Consumer and Producer Surplus****

Consider the market for coffee, where the demand and supply equations are given by:

Demand: $Q_d = 200 - 4P$

Supply: $Q_s = 50 + 2P$

a) Calculate the equilibrium price and quantity.

To find the equilibrium price and quantity, set the quantity demanded equal to the quantity supplied:

$$Q_d = Q_s$$

$$200 - 4P = 50 + 2P$$

Solving for P : $200 - 50 = 4P + 2P$ $150 = 6P$ $P = 25$

Substitute $P = 25$ into either the demand or supply equation to find the equilibrium quantity:

$$Q_d = 200 - 4(25) = 200 - 100 = 100$$

b) Determine the consumer and producer surplus at equilibrium.

Consumer Surplus: Consumer surplus is the area below the demand curve and above the price. It can be calculated as the area of the triangle formed by the demand curve, the price axis, and the equilibrium quantity:

$$CS = \frac{1}{2} \times (25) \times (100) = \$1250$$

Producer Surplus: Producer surplus is the area above the supply curve and below the price. It can be calculated as the area of the triangle formed by the supply curve, the price axis, and the equilibrium quantity:

$$PS = \frac{1}{2} \times (25) \times (100) = \$1250$$

****Exercise 4: Price Controls****

Suppose the government imposes a price ceiling of \$3 in the market for coffee. Using the demand and supply equations from Exercise 3:

a) Determine the new equilibrium price and quantity after the price ceiling is imposed.

With a price ceiling of \$3, the new equilibrium price will be \$3 (since the price cannot exceed the ceiling). Substitute $P = 3$ into either the demand or supply equation to find the equilibrium quantity:

$$Q_d = 200 - 4(3) = 188$$

$$\text{Consumer Surplus: } CS = \frac{1}{2} \times (3) \times (188 - 50) = \$564$$

Producer Surplus: $PS = 0$ (since producers cannot sell at a price above \$3)

b) Calculate the deadweight loss resulting from the price ceiling.

Deadweight Loss: The deadweight loss from the price ceiling can be calculated as the area of the triangle formed by the demand curve, supply curve, and the quantity difference between the original equilibrium and the new equilibrium:

$$DWL = 12 \times (25 - 2) \times (100 - 188) = \$543$$

I'll continue with the solutions to the remaining exercises in the next message.

****Exercise 5: Income Elasticity****

Suppose the quantity demanded of smartphones increases from 100 to 120 when consumer income increases from \$50,000 to \$60,000. Using the midpoint method:

a) Calculate the income elasticity of demand.

Income elasticity of demand (E_y) is calculated using the formula:

$$E_y = \frac{\% \text{ change in income}}{\% \text{ change in quantity demanded}}$$

Given: Initial quantity demanded (Q_{d1}) = 100

Final quantity demanded (Q_{d2}) = 120

Initial income (I_1) = \$50,000

Final income (I_2) = \$60,000

Using the midpoint method:

$$\% \text{ change in quantity demanded} = \frac{Q_{d2} - Q_{d1}}{\frac{Q_{d1} + Q_{d2}}{2}} \times 100$$

$$\% \text{ change in income} = \frac{I_2 - I_1}{\frac{I_1 + I_2}{2}} \times 100$$

$$\% \text{ change in quantity demanded} = \frac{120 - 100}{\frac{100 + 120}{2}} \times 100 = \frac{20}{110} \times 100 \approx 18.18\%$$

$$\% \text{ change in income} = \frac{60000 - 50000}{\frac{50000 + 60000}{2}} \times 100 = \frac{10000}{55000} \times 100 \approx 18.18\%$$

$$E_y = 18.18 / 18.18 = 1$$

b) Interpret the income elasticity value.

An income elasticity of 1 indicates unitary elasticity, meaning that a 1% increase in income leads to a 1% increase in quantity demanded. In this case, the income elasticity value of 1 suggests that smartphones are a normal good with income elasticity proportional to income changes.

****Exercise 6: Cross-Price Elasticity****

Suppose the quantity demanded of tablets increases from 80 to 100 when the price of smartphones decreases from \$400 to \$350. Using the midpoint method:

a) Calculate the cross-price elasticity of demand between smartphones and tablets.

b) Interpret the cross-price elasticity value.