Week 5

AP Microeconomics

Homework bundle for this week

本周作业合集

exercises.lol

Contents 目录

2. Supply and Demand

Starter Quiz · 课前小测

AP Microeconomics Name: _____ Score: _____

1. The law of demand says that, other things equal, when price rises the quantity demanded:
   - ☐ falls
   - ☐ rises
   - ☐ stays the same
   - ☐ doubles
2. The law of supply says that, other things equal, when price rises the quantity supplied:
   - ☐ rises
   - ☐ falls
   - ☐ stays the same
   - ☐ becomes negative
3. Price elasticity of demand is calculated as:
   - ☐ % change in quantity demanded ÷ % change in price
   - ☐ % change in price ÷ % change in quantity demanded
   - ☐ price × quantity
   - ☐ change in quantity ÷ change in price
4. Price elasticity of supply is normally:
   - ☐ positive, because price and quantity supplied move together
   - ☐ negative, because price and quantity move apart
   - ☐ always zero
   - ☐ always exactly one
5. Two goods have a **positive** cross-price elasticity. They are:
   - ☐ substitutes
   - ☐ complements
   - ☐ both inferior goods
   - ☐ unrelated
6. Price rises from 4 to 6; quantity demanded falls from 120 to 80. Using the midpoint method, what is |PED|?

   _____

7. Price rises causing a 30% rise in quantity supplied and a 10% rise in price. What is PES?

   _____

8. Printers and ink are complements, so their cross-price elasticity is negative.

   ☐ True ☐ False

9. Demand is $P = 20 - Q$ and supply is $P = 2 + Q$. What is the equilibrium quantity Q?

   _____

10. Equilibrium is 5 dollars and 100 units. A price ceiling of 3 dollars gives quantity demanded 140 and quantity supplied 70. What is the size of the shortage?

    _____ units

AP Microeconomics

1. **falls**

   Price and quantity demanded move in opposite directions — an inverse relationship.

2. **rises**

   Price and quantity supplied move in the same direction — a direct relationship.

3. **% change in quantity demanded ÷ % change in price**

   PED divides the percentage change in quantity by the percentage change in price.

4. **positive, because price and quantity supplied move together**

   Supply obeys a direct relationship, so PES is positive.

5. **substitutes**

   Positive XED: a dearer Y sends buyers to X — the goods substitute for each other.

6. **1**

   %ΔQ = -40/100 = -0.40 and %ΔP = 2/5 = 0.40, so PED = -1 and |PED| = 1 (unit elastic).

7. **3**

   PES = 30% ÷ 10% = 3 — elastic supply.

8. **True**

   A dearer printer lowers ink demand — a negative XED marks complements.

9. **9**

   Set 20 − Q = 2 + Q, so 18 = 2Q and Q = 9.

10. **70 units**

    Shortage = quantity demanded − quantity supplied = 140 − 70 = 70.

AP MICROECONOMICS • EXERCISE SHEET

2.1 Demand

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS demand 需求 • income effect 收入效应 • substitution effect 替代效应 • law of demand 需求定律 • supply 供给

Objective

Build the skills to answer exam questions on **demand**.

You must be able to:

- state the **law of demand** 需求定律 and the inverse price-quantity relationship
- explain the downward slope with the **substitution effect** 替代效应 and **income effect** 收入效应
- distinguish a movement **along** demand from a **shift**
- derive **market demand** by horizontally summing individual demand

1 Worked examples

Study these first. Each one shows the method for a question type used later.

The law of demand

As price rises, quantity demanded falls — the demand curve slopes **downward**.

Why it slopes down

- **Substitution effect** — the good becomes dearer relative to others, so buyers switch away.
- **Income effect** — a higher price lowers real purchasing power.

Movement vs shift; market demand

A change in the good's **own price** is a movement along the curve; a determinant change **shifts** it. **Market demand** is the horizontal sum of all individual demand curves.

2 Practice

2.1 State the law of demand. [1]

2.2 Name the two effects that explain the downward slope of demand. [2]

2.3 State how market demand is derived from individual demand curves. [1]

3 Exam-style questions

3.1 The demand curve slopes downward because of the substitution effect and the [1]

- **A** income effect
- **B** supply effect
- **C** tax effect
- **D** scale effect

3.2 A change in a good's own price causes a [1]

- **A** shift of the demand curve
- **B** movement along the demand curve
- **C** shift of the supply curve
- **D** no change at all

3.3 The price of a good falls.

(a) State the effect on the quantity demanded. [1]

(b) State whether this is a movement along or a shift of the curve. [1]

(c) Name one determinant that would instead shift demand. [1]

Solutions

2.1 as the price of a good rises, the quantity demanded falls (other things equal).

2.2 the substitution effect and the income effect.

2.3 by horizontally summing (adding the quantities of) all individual demand curves at each price.

3.1 A.

3.2 B.

3.3 (a) it rises. (b) a movement along the curve. (c) any one of: income, tastes, prices of related goods, expectations, number of buyers.

3. In the local market for Good X, there are four individual buyers: Emily, Wu, Omar, and Fernanda. The quantities that each individual buyer would be willing and able to purchase at different prices are included in the table provided.

	Quantity of Good X			
Price	Emily	Wu	Omar	Fernanda
$1	5	4	4	3
$2	4	3	4	3
$3	4	3	3	2
$4	3	2	3	2
$5	3	2	2	1
$6	2	1	2	1
$7	2	1	1	0
$8	1	0	1	0

(a) The local market for Good X has a perfectly elastic supply. Draw a correctly labeled graph for the local market for Good X with a market equilibrium price of $5. Label the equilibrium price as $5, and label the equilibrium quantity for the market with a specific value based on the data provided in the table.

(b) Assume the cost of production increases, which causes the price of Good X to increase from $5 to $7.

(i) Calculate the price elasticity of demand for Good X as the price increases from $5 to $7. Show your work.

(ii) Identify whether the demand for Good X is elastic, inelastic, or unit elastic in that range of prices.

(c) Could Emily's marginal benefit for the second unit of Good X equal $4.50 ? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM

AP MICROECONOMICS • EXERCISE SHEET

2.2 Supply

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS law of supply 供给定律 • marginal costs 边际成本 • subsidies 补贴 • supply 供给 • demand 需求

Objective

Build the skills to answer exam questions on **supply**.

You must be able to:

- state the **law of supply** 供给定律 and the direct price-quantity relationship
- explain the upward slope in terms of rising **marginal costs** 边际成本
- distinguish a movement **along** supply from a **shift**
- derive **market supply** by horizontally summing individual supply

1 Worked examples

Study these first. Each one shows the method for a question type used later.

The law of supply

As price rises, quantity supplied rises — the supply curve slopes **upward** because higher prices cover the **rising marginal cost** of extra output.

Movement vs shift

A change in the good's **own price** is a movement along the curve; a determinant change (input prices, technology, taxes, expectations, number of sellers) **shifts** it.

Market supply

The horizontal sum of all individual firms' supply curves.

2 Practice

2.1 State the law of supply. [1]

2.2 State why the supply curve slopes upward. [1]

2.3 State how market supply is derived from individual supply curves. [1]

3 Exam-style questions

3.1 The supply curve slopes upward because of rising [1]

- **A** demand
- **B** marginal costs
- **C** taxes
- **D** incomes

3.2 An improvement in technology shifts the supply curve [1]

- **A** to the left
- **B** to the right
- **C** not at all
- **D** vertically

3.3 The wage paid to workers producing a good rises.

(a) State the effect on supply. [1]

(b) State the direction the supply curve shifts. [1]

(c) Name one other determinant of supply. [1]

Solutions

2.1 as the price of a good rises, the quantity supplied rises (other things equal).

2.2 producing extra units costs more (rising marginal cost), so a higher price is needed to supply more.

2.3 by horizontally summing all individual firms' supply curves at each price.

3.1 B.

3.2 B.

3.3 (a) supply falls. (b) to the left. (c) any one of: input prices, technology, taxes/subsidies, expectations, number of sellers.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.
   (a) Draw correctly labeled side-by-side graphs for the corn market and a representative corn farmer. On your graphs show each of the following.
      (i) The equilibrium price and quantity in the corn market, labeled P_M and Q_M, respectively
      (ii) The profit-maximizing quantity of corn produced by the representative farmer earning zero economic profit, labeled Q_F
   (b) Assume the demand for ethanol increases. On your graphs in part (a) show what will happen to each of the following in the short run.
      (i) The market price and quantity of corn, labeled P^* and Q^*
      (ii) The area of the profit or loss earned by the representative corn farmer, shaded completely
   (c) Relative to your answer in part (b), state what will happen to the market equilibrium price and quantity of corn in the long run. Explain.
   (d) Soybeans are produced in a perfectly competitive market. Assume farmers can grow either corn or soybeans on the same land. What happens to the price of soybeans in the next planting season if the price of corn increases? Explain.
   (e) Assume instead that the government sets a binding price ceiling in the corn market. Draw a new correctly labeled graph for the corn market and show each of the following.
      (i) The binding price ceiling, labeled P_c
      (ii) The quantity purchased by consumers in the corn market, labeled Q_p

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

AP MICROECONOMICS • EXERCISE SHEET

2.3 Price Elasticity of Demand

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS elastic 富有弹性 • inelastic 缺乏弹性 • price elasticity of demand 需求价格弹性 • total revenue 总收入 • total revenue test 总收益检验

Objective

Build the skills to answer exam questions on **price elasticity of demand**.

You must be able to:

- define **price elasticity of demand (PED)** 需求价格弹性
- calculate PED using the **midpoint (arc) method** 中点法
- classify demand as **elastic**, **inelastic**, or **unit elastic**
- use the **total revenue test** 总收益检验

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **PED**

$$\text{PED} = \frac{\%\Delta Q_d}{\%\Delta P},$$

using the **midpoint method**, where each percentage change is divided by the **average** of the two values. Take the absolute value.

■ **Classification**

$|\text{PED}| > 1$ elastic; < 1 inelastic; $= 1$ unit elastic.

■ **Total revenue test**

If demand is **elastic**, cutting price **raises** total revenue; if **inelastic**, raising price raises revenue.

2 Practice

2.1 Define price elasticity of demand. [1]

2.2 Price rises from \$10 to \$12 and quantity demanded falls from 100 to 80. Find the PED (midpoint method). [2]

2.3 State whether demand is elastic or inelastic if $|\text{PED}| = 0.5$. [1]

3 Exam-style questions

3.1 Demand is elastic when |PED| is [1]

- **A** less than 1
- **B** equal to 1
- **C** greater than 1
- **D** zero

3.2 If demand is inelastic, raising the price will [1]

- **A** raise total revenue
- **B** lower total revenue
- **C** leave revenue unchanged
- **D** raise quantity demanded

3.3 A good has few substitutes and takes only a small share of income.

(a) State whether its demand is likely elastic or inelastic. [1]

(b) If the firm wants more revenue, state whether it should raise or lower the price. [1]

(c) Name one determinant of PED. [1]

Solutions

2.1 the responsiveness of quantity demanded to a change in price.

2.2 $\%\Delta Q = \dfrac{-20}{90} = -22\%$; $\%\Delta P = \dfrac{2}{11} = 18\%$; $|\text{PED}| = \dfrac{22}{18} \approx 1.2$.

2.3 inelastic.

3.1 C.

3.2 A.

3.3 (a) inelastic. (b) raise the price. (c) any one of: availability of substitutes, share of income, time.

1. Voda Reservoir is a profit-maximizing firm and the only producer of bottled water in a country. Currently, Voda Reservoir is earning negative economic profit.

A. Draw a correctly labeled graph for Voda Reservoir and show each of the following.

i. The profit-maximizing quantity, labeled Q_M

ii. The profit-maximizing price, labeled P_M

iii. The average total cost curve consistent with Voda Reservoir earning negative economic profit, labeled ATC

iv. The area of deadweight loss, shaded completely

B. Suppose the government requires Voda Reservoir to produce the socially optimal quantity of bottled water. On your graph in part A, show the socially optimal quantity of bottled water, labeled Q_S.

C. Suppose instead the government grants a per-unit subsidy to Voda Reservoir. What will happen to Voda Reservoir's profit-maximizing quantity of bottled water? Explain.

D. Suppose new producers have entered the bottled-water market and Voda Reservoir continues to operate in the bottled-water market. Will the demand for Voda Reservoir's bottled water become more elastic, become less elastic, or stay the same as new producers enter the market?

E. Voda Reservoir hires workers in a perfectly competitive labor market.

i. If the demand for bottled water increases, what will happen to Voda Reservoir's demand for labor? Explain.

ii. The government implements a new regulation that increases the minimum age required for a worker to be employed in a bottled-water factory. What will happen to the market wage in the short run? Explain.

1. Soja Farm is a typical profit-maximizing firm that produces and sells soybeans in a constant-cost, perfectly competitive market that is in long-run equilibrium. The market equilibrium price of soybeans is $14 per bushel.

(a) Draw correctly labeled side-by-side graphs for the soybean market and for Soja Farm, and show each of the following.

(i) The market equilibrium price and quantity, labeled $14 and Q_M, respectively
(ii) Soja Farm's profit-maximizing price and quantity, labeled P_F and Q_F, respectively
(iii) Soja Farm's average total cost curve consistent with a long-run equilibrium, labeled ATC

(b) If Soja Farm is the only firm in the market that chooses to increase its price of soybeans to $15 per bushel, will Soja Farm's total revenue increase by $1, remain the same, or decrease to $0 ? Explain.

(c) Soybeans are used as an input in the production of tofu. Tofu now becomes a more popular food option among consumers. On your graphs in part (a), show the short-run effect of the increased popularity of tofu on each of the following.

(i) The new market equilibrium price and quantity of soybeans, labeled P_2 and Q_2, respectively
(ii) Soja Farm's new profit-maximizing quantity, labeled Q*

(d) Given the increase in popularity of tofu in part (c), what will happen to the number of firms in the soybean market in the long run? Explain.

(e) Suppose a 25% increase in the market price of quinoa causes a 5% decrease in the quantity demanded of quinoa and a 10% increase in the quantity demanded for tofu.

(i) Is the demand for quinoa elastic, inelastic, or unit elastic? Explain using numbers.
(ii) Calculate the cross-price elasticity of demand between quinoa and tofu. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

1. Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

   (a) Draw a correctly labeled graph for Arzeye Pharma and show each of the following.

   (i) The profit-maximizing quantity of eye treatments, labeled Q^*
   (ii) The profit-maximizing price, labeled P^*
   (iii) The average total cost curve consistent with positive economic profit, labeled ATC
   (iv) The area representing consumer surplus, shaded completely

   (b) Suppose Arzeye Pharma wants to charge a price that maximizes its total revenue rather than its profit.

   (i) On your graph in part (a), show the revenue-maximizing quantity, labeled Q_R.
   (ii) At quantity Q_R identified in part (b)(i), is the demand for eye treatments elastic, inelastic, or unit elastic?

   (c) Suppose now that Arzeye Pharma engages in perfect price discrimination.

   (i) On your graph in part (a), show the lowest price that Arzeye Pharma would charge, labeled P_2.
   (ii) What would happen to consumer surplus? Explain.

   (d) Suppose instead that Arzeye Pharma's patent expires. Will the demand for Arzeye Pharma's treatment become more elastic, become less elastic, or not change? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

1. A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.

   (a) Draw a correctly labeled graph for the firm and show each of the following.

   (i) The quantity of carbon-capture devices produced by the firm, labeled Q_M
   (ii) The price charged by the firm, labeled P_M
   (iii) The area representing consumer surplus, shaded completely

   (b) The government is considering different options to regulate the firm.

   (i) Suppose the government is considering taxing the firm. Could using a per-unit tax change the firm's output to the socially optimal quantity? Explain.
   (ii) Instead, suppose the government imposes a price ceiling so that the firm produces the socially optimal quantity. On your graph in part (a), label the quantity and price after the price ceiling is imposed as Q_C and P_C.
   (iii) At the price and the quantity identified in part (b)(ii), is the firm earning positive economic profit? Explain.

   (c) Assume the government decides not to regulate the firm and instead the firm produces the quantity of output that maximizes total revenue.

   (i) If the firm now increases its output by one unit, would marginal revenue be positive, negative, or zero? Explain.
   (ii) Starting at the total-revenue-maximizing quantity, if the firm reduces the price by 10%, would the quantity demanded increase by less than 10%, by more than 10%, or by exactly 10% ?

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. In the local market for Good X, there are four individual buyers: Emily, Wu, Omar, and Fernanda. The quantities that each individual buyer would be willing and able to purchase at different prices are included in the table provided.

	Quantity of Good X			
Price	Emily	Wu	Omar	Fernanda
$1	5	4	4	3
$2	4	3	4	3
$3	4	3	3	2
$4	3	2	3	2
$5	3	2	2	1
$6	2	1	2	1
$7	2	1	1	0
$8	1	0	1	0

(a) The local market for Good X has a perfectly elastic supply. Draw a correctly labeled graph for the local market for Good X with a market equilibrium price of $5. Label the equilibrium price as $5, and label the equilibrium quantity for the market with a specific value based on the data provided in the table.

(b) Assume the cost of production increases, which causes the price of Good X to increase from $5 to $7.

(i) Calculate the price elasticity of demand for Good X as the price increases from $5 to $7. Show your work.

(ii) Identify whether the demand for Good X is elastic, inelastic, or unit elastic in that range of prices.

(c) Could Emily's marginal benefit for the second unit of Good X equal $4.50 ? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM

1. The government of an island nation grants SkyRunner Airlines exclusive monopoly rights to serve the island. SkyRunner is earning positive economic profits.

(a) Draw a correctly labeled graph for SkyRunner, and show each of the following.

(i) The profit-maximizing quantity of tickets, labeled Q_M
(ii) The profit-maximizing price of a ticket, labeled P_M
(iii) The area representing profits, shaded completely

Now the island's tourist bureau asks the government to consider the following two proposals.

- Proposal I: Set a price ceiling on tickets that eliminates all deadweight loss.
- Proposal II: Eliminate SkyRunner's monopoly rights, which will remove all barriers to entry.

(b) Suppose the government adopts proposal I. On your graph in part (a), indicate the quantity of tickets sold in the short run, labeled Q_C.

(c) Suppose instead the government adopts proposal II. How will each of the following be affected in the long run compared to the market conditions in part (a) ?

(i) The quantity of tickets sold by SkyRunner. Explain.
(ii) The price elasticity of demand for SkyRunner's airline service. Explain.
(iii) SkyRunner's profits
(iv) The deadweight loss in the market. Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

1. NCHart is a corporation that has developed and patented a new drug to treat heart disease. There are no substitutes for this drug, giving NCHart a monopoly.

(a) Draw a correctly labeled graph of NCHart making a positive economic profit, and show each of the following.

(i) The profit-maximizing quantity, labeled Q_m
(ii) The profit-maximizing price, labeled P_m

(b) At Q_m from part (a)(i), is demand elastic, unit elastic, or inelastic? Explain using information from the graph.

(c) Instead of maximizing profit, suppose NCHart considers providing the new drug to as many patients as possible as long as it can generate enough revenue to cover its total costs.

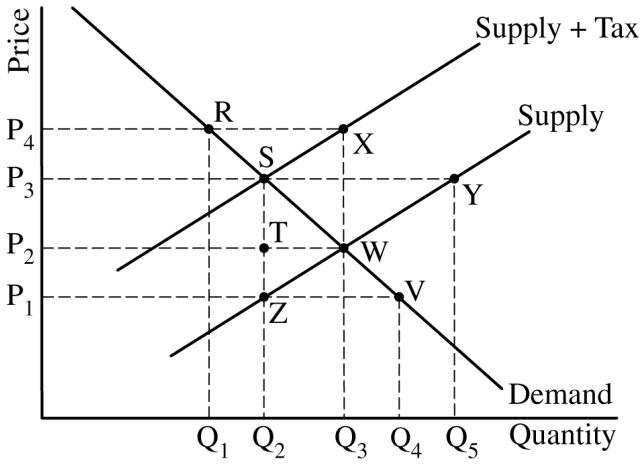
(i) On your graph from part (a), show the quantity that is consistent with this goal, labeled Q_z.
(ii) At Q_z from part (c)(i), is there a deadweight loss? Explain.

(d) NCHart's patent expires next year, and a new firm, TXDrug, is considering whether to Enter this market or Stay Out. NCHart can either produce Q_m or Q_z. The firms independently and simultaneously choose their actions. The first entry in the payoff matrix represents NCHart's payoff and the second entry represents TXDrug's payoff. Both firms have complete information. Use the payoff matrix below to answer the following questions.

		TXDrug: Stay Out	TXDrug: Enter
NCHart	Q_m	\$10, \$0	\$4, \$1
	Q_z	\$0, \$0	–\$2, –\$1

(i) Does TXDrug have a dominant strategy? Explain using strategies and payoffs from the payoff matrix.
(ii) What is the best response for NCHart if TXDrug chooses to Stay Out?
(iii) Identify the Nash equilibrium.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.



2. Hats are produced in a perfectly competitive industry, and the government imposes a per-unit sales tax on hats.
   (a) Using the labeling from the graph, identify each of the following.
      (i) The after-tax price paid by consumers and the after-tax quantity
      (ii) The area representing the total tax revenue received by the government
   (b) Now assume instead that the demand for hats is perfectly inelastic at Q_3, while the supply and the per-unit tax remain unchanged.
      (i) Will the after-tax price paid by consumers be higher, lower, or the same compared to the price in your answer to part (a)(i) ?
      (ii) Will the total tax revenue received by the government be higher, lower, or the same compared to the tax revenue in your answer to part (a)(ii) ? Explain.
   (c) If the demand for hats remains perfectly inelastic at Q_3 and the per-unit sales tax is reduced, will producer surplus increase, decrease, or stay the same? Explain.

MICROECONOMICS
Section II
Total Time—1 hour
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. In the early twentieth century, limited transportation options and the lack of effective substitutes gave Single Cinema monopoly power in a small town. Assume that Single Cinema is a profit-maximizing firm and currently operates at a negative economic profit in the short run.

   (a) Draw a correctly labeled graph for Single Cinema, and show each of the following.

      (i) The profit-maximizing price and quantity of tickets, labeled as P_m and Q_m, respectively

      (ii) The area representing the negative economic profit, shaded completely

   (b) Explain why Single Cinema continues to operate in the short run despite earning negative economic profit in the short run.

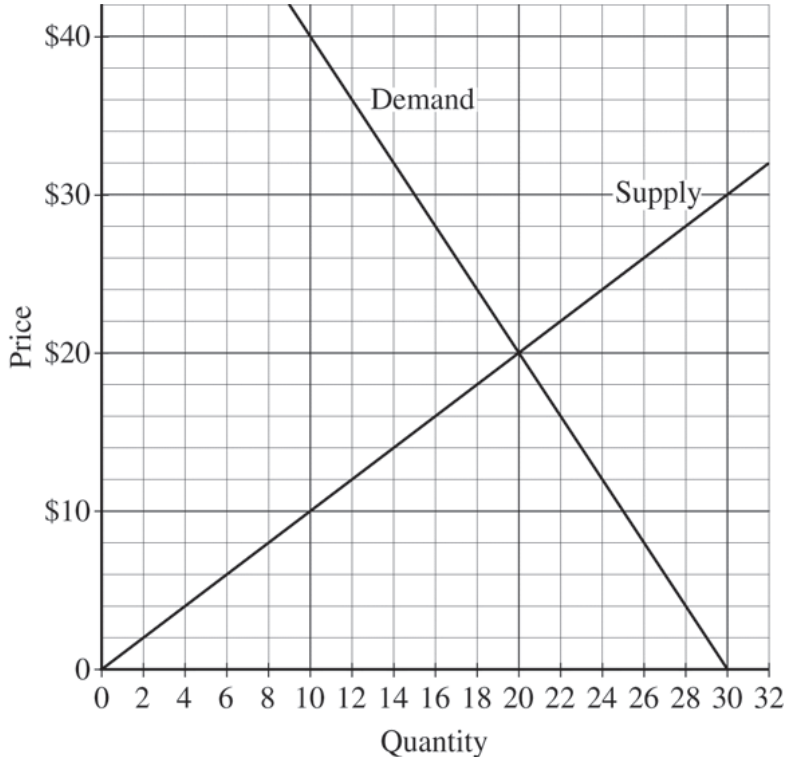
   (c) Would Single Cinema's total revenue increase, decrease, or stay the same if it decides to sell one fewer ticket than Q_m? Explain.

   (d) Single Cinema hires workers in a perfectly competitive labor market with a downward-sloping demand curve. Suppose the number of workers available in the market decreases.

      (i) What will happen to the wage rate? Explain.

      (ii) What will happen to the marginal revenue product of the last worker hired? Explain.

3. The graph below shows the market for widgets. The government is considering intervening in this market.



(a) Calculate the total producer surplus at the market equilibrium price and quantity. Show your work.

(b) If the government imposes a price floor at $16, is there a shortage, a surplus, or neither? Explain.

(c) If instead the government imposes a price ceiling at $12, is there a shortage, a surplus, or neither? Explain.

(d) If instead the government restricts the market output to 10 units, calculate the deadweight loss. Show your work.

(e) Assume the price decreases from $20 to $12.
   (i) Calculate the price elasticity of demand. Show your work.
   (ii) In this price range, is demand perfectly elastic, relatively elastic, unit elastic, relatively inelastic, or perfectly inelastic?

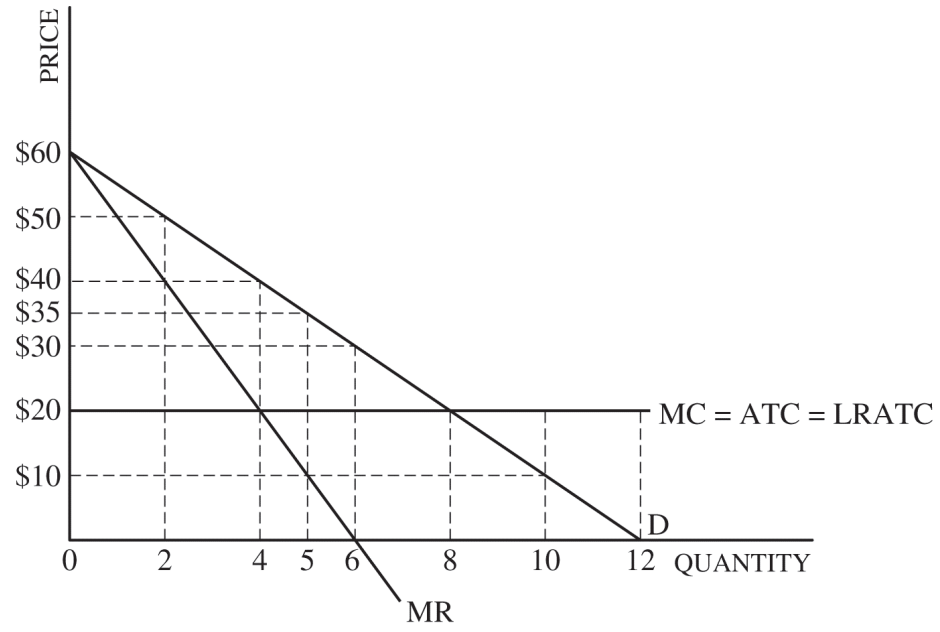
STOP

END OF EXAM

MICROECONOMICS
Section II
Planning time—10 minutes
Writing time—50 minutes

Directions: You have 10 minutes to read all of the questions in this booklet, to sketch graphs, to make notes, and to plan your answers. You will then have 50 minutes to answer all three of the following questions. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. In answering the questions, you should emphasize the line of reasoning that generated your results; it is not enough to list the results of your analysis. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The graph below shows the demand curve (D), marginal revenue curve (MR), marginal cost curve (MC), average total cost curve (ATC), and long-run average total cost curve (LRATC) for a monopolist.



(a) Using the numbers given in the graph, identify each of the following for the profit-maximizing monopolist.

(i) The quantity produced

(ii) The price

(iii) The allocatively efficient quantity

(b) At the profit-maximizing quantity from part (a)(i), is the monopolist experiencing economies of scale? Explain.

3. Assume that gasoline is sold in a competitive market in which demand is relatively inelastic and supply is relatively elastic.

   (a) Draw a correctly labeled graph of the gasoline market. On your graph show the equilibrium price and quantity of gasoline, labeled P_E and Q_E.

   (b) Suppose the government imposes a $2 per unit tax on the producers of gasoline. On your graph from part (a), show each of the following after the tax is imposed.

      (i) The price paid by buyers, labeled P_B

      (ii) The after-tax price received by sellers, labeled P_S

      (iii) The quantity, labeled Q_T

   (c) Using the labeling on your graph, explain how to calculate the total tax revenue collected by the government.

   (d) Will the tax burden fall entirely on buyers, entirely on sellers, more on buyers and less on sellers, more on sellers and less on buyers, or equally on buyers and sellers? Explain.

STOP

END OF EXAM

AP MICROECONOMICS • EXERCISE SHEET

2.4 Price Elasticity of Supply

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS price elasticity of supply 供给价格弹性 • elastic 富有弹性 • supply 供给 • inelastic 缺乏弹性

Objective

Build the skills to answer exam questions on **price elasticity of supply**.

You must be able to:

- define **price elasticity of supply (PES)** 供给价格弹性
- calculate PES using the **midpoint (arc) method**
- classify supply as elastic, inelastic, unit, **perfectly elastic**, or **perfectly inelastic**
- explain how the **time horizon** and spare capacity affect PES

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **PES**

$$\text{PES} = \frac{\%\Delta Q_s}{\%\Delta P},$$

using the midpoint method.

■ **Classification**

>1 elastic; <1 inelastic; $=1$ unit. A **perfectly inelastic** supply is **vertical** (PES $= 0$); a **perfectly elastic** supply is horizontal.

■ **What makes supply elastic**

A longer **time horizon** and more **spare capacity** make supply more elastic — firms can adjust output more.

2 Practice

2.1 Define price elasticity of supply. [1]

2.2 Price rises from \$8 to \$12 and quantity supplied rises from 40 to 60. Find the PES (midpoint method). [2]

2.3 State how a longer time horizon affects PES. [1]

3 Exam-style questions

3.1 Supply is elastic when PES is [1]

- **A** less than 1
- **B** equal to 1
- **C** greater than 1
- **D** zero

3.2 A perfectly inelastic supply curve is [1]

- **A** horizontal
- **B** vertical
- **C** upward-sloping
- **D** downward-sloping

3.3 A farm can quickly grow more output using its spare land.

(a) State whether its supply is likely elastic or inelastic. [1]

(b) State one factor that makes supply more elastic. [1]

(c) State the PES of a vertical (fixed-quantity) supply curve. [1]

Solutions

2.1 the responsiveness of quantity supplied to a change in price.

2.2 $\%\Delta Q = \frac{20}{50} = 40\%$; $\%\Delta P = \frac{4}{10} = 40\%$; PES $= \frac{40}{40} = 1$ (unit elastic).

2.3 it makes supply more elastic.

3.1 C.

3.2 B.

3.3 (a) elastic. (b) a longer time horizon or more spare capacity (any one). (c) zero.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

3. Assume that gasoline is sold in a competitive market in which demand is relatively inelastic and supply is relatively elastic.

   (a) Draw a correctly labeled graph of the gasoline market. On your graph show the equilibrium price and quantity of gasoline, labeled P_E and Q_E.

   (b) Suppose the government imposes a $2 per unit tax on the producers of gasoline. On your graph from part (a), show each of the following after the tax is imposed.

      (i) The price paid by buyers, labeled P_B

      (ii) The after-tax price received by sellers, labeled P_S

      (iii) The quantity, labeled Q_T

   (c) Using the labeling on your graph, explain how to calculate the total tax revenue collected by the government.

   (d) Will the tax burden fall entirely on buyers, entirely on sellers, more on buyers and less on sellers, more on sellers and less on buyers, or equally on buyers and sellers? Explain.

STOP

END OF EXAM

AP MICROECONOMICS • EXERCISE SHEET

2.5 Other Elasticities

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS cross-price elasticity 交叉价格弹性 • income elasticity 收入弹性 • elastic 富有弹性 • demand 需求 • price elasticity of demand 需求价格弹性

Objective

Build the skills to answer exam questions on **other elasticities**.

You must be able to:

- define and calculate **cross-price elasticity of demand** 交叉价格弹性
- use its sign to classify goods as **substitutes** or **complements**
- define and calculate **income elasticity of demand** 收入弹性
- use its sign to classify goods as **normal** or **inferior**

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **Cross-price elasticity**

$$\text{XED} = \frac{\%\Delta Q_d \text{ of good A}}{\%\Delta P \text{ of good B}}.$$

Positive → substitutes; **negative** → complements.

■ **Income elasticity**

$$\text{YED} = \frac{\%\Delta Q_d}{\%\Delta \text{income}}.$$

Positive → normal good; **negative** → inferior good.

2 Practice

2.1 State what a **positive** cross-price elasticity means about two goods. [1]

2.2 State what a **negative** income elasticity means about a good. [1]

2.3 When income rises 10%, demand for a good falls 5%. Find the income elasticity and classify the good. [2]

3 Exam-style questions

3.1 Two goods with a **negative** cross-price elasticity are [1]

- **A** substitutes
- **B** complements
- **C** normal goods
- **D** inferior goods

3.2 A normal good has an income elasticity that is [1]

- **A** negative
- **B** zero
- **C** positive
- **D** infinite

3.3 The price of tea rises 20% and the quantity of coffee demanded rises 10%.

(a) Find the cross-price elasticity. [2]

(b) State whether tea and coffee are substitutes or complements. [1]

Solutions

2.1 they are substitutes.

2.2 it is an inferior good.

2.3 YED $= \dfrac{-5\%}{10\%} = -0.5$; negative, so it is an **inferior** good.

3.1 B.

3.2 C.

3.3 (a) XED $= \dfrac{+10\%}{+20\%} = +0.5$. (b) substitutes (positive XED).

3. The table provided shows the marginal utility for Lucy when she consumes Good X and Good Y.

Quantity of Good X	Marginal Utility of Good X (utils)	Quantity of Good Y	Marginal Utility of Good Y (utils)
1	20	1	28
2	16	2	24
3	12	3	16
4	8	4	8
5	4	5	–4
6	–2	6	–8

A. If Good X and Good Y are free, how many units of each good will maximize Lucy's total utility?

B. Calculate Lucy's total utility if she consumes 2 units of Good X and 2 units of Good Y. Show your work.

C. Suppose instead that the price of each unit of Good X is \$2 and the price of each unit of Good Y is \$4. Lucy has a budget of \$20 to spend on the two goods.

i. If Lucy purchases 2 units of Good X, what is the maximum quantity of Good Y Lucy can purchase?

ii. What is Lucy's optimal combination of Good X and Good Y? Explain your answer using marginal analysis and numbers.

D. Suppose the price elasticity of demand for Good X is -2.0, the price elasticity of demand for Good Y is -0.8, and the cross-price elasticity of demand between Good X and Good Y is $+1.6$. Are goods X and Y complementary goods, substitute goods, normal goods, or inferior goods? Explain.

STOP

END OF EXAM

1. Soja Farm is a typical profit-maximizing firm that produces and sells soybeans in a constant-cost, perfectly competitive market that is in long-run equilibrium. The market equilibrium price of soybeans is $14 per bushel.

(a) Draw correctly labeled side-by-side graphs for the soybean market and for Soja Farm, and show each of the following.

(i) The market equilibrium price and quantity, labeled $14 and Q_M, respectively
(ii) Soja Farm's profit-maximizing price and quantity, labeled P_F and Q_F, respectively
(iii) Soja Farm's average total cost curve consistent with a long-run equilibrium, labeled ATC

(b) If Soja Farm is the only firm in the market that chooses to increase its price of soybeans to $15 per bushel, will Soja Farm's total revenue increase by $1, remain the same, or decrease to $0 ? Explain.

(c) Soybeans are used as an input in the production of tofu. Tofu now becomes a more popular food option among consumers. On your graphs in part (a), show the short-run effect of the increased popularity of tofu on each of the following.

(i) The new market equilibrium price and quantity of soybeans, labeled P_2 and Q_2, respectively
(ii) Soja Farm's new profit-maximizing quantity, labeled Q*

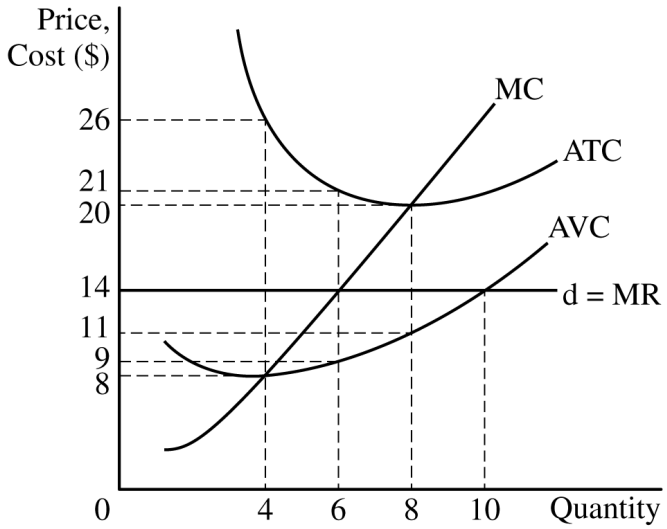
(d) Given the increase in popularity of tofu in part (c), what will happen to the number of firms in the soybean market in the long run? Explain.

(e) Suppose a 25% increase in the market price of quinoa causes a 5% decrease in the quantity demanded of quinoa and a 10% increase in the quantity demanded for tofu.

(i) Is the demand for quinoa elastic, inelastic, or unit elastic? Explain using numbers.
(ii) Calculate the cross-price elasticity of demand between quinoa and tofu. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. The graph provided shows the demand (d), marginal revenue (MR), average total cost (ATC), average variable cost (AVC), and marginal cost (MC) curves for Hansel Hangout, a typical profit-maximizing firm in a perfectly competitive market producing Good X.



(a) Calculate Hansel Hangout's total fixed cost. Show your work.

(b) Identify the price and Hansel Hangout's profit-maximizing quantity of Good X.

(c) Calculate Hansel Hangout's economic profit at the quantity identified in part (b). Show your work.

(d) As the market for Good X adjusts to the long-run equilibrium, what will happen to the price of Good X? Explain.

(e) Assume the cross-price elasticity of demand between Good X and Good C is positive. Given the change in the long-run price of Good X in part (d), will the quantity demanded of Good C increase, decrease, or remain the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM

2. The following is a table showing Dana's marginal benefit from purchasing bottles of water and good X from a grocery store.

Quantity of Water (in bottles)	Marginal Benefit of Water (in dollars)		Quantity of Good X (in units)	Marginal Benefit of Good X (in dollars)
1	24		1	24
2	18		2	18
3	12		3	12
4	6		4	6
5	3		5	3

(a) What is Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X? Show your work.

(b) Assume the price of a unit of good X is $5. Calculate the total consumer surplus if Dana purchases 3 units of good X. Show your work.

(c) Now assume the price of a bottle of water is $3 and the price of a unit of good X is $6. Dana spends her entire budget of $30 on bottles of water and good X.

(i) Explain why Dana does not maximize her benefit when she purchases 2 bottles of water and 4 units of good X. Use marginal analysis to explain your answer.

(ii) What are the optimal quantities of good X and bottles of water at these prices?

(iii) Suppose the price of a unit of good X drops to $3. Calculate Dana's cross-price elasticity of demand for bottles of water with respect to the price of good X, and state whether the two goods are substitutes or complements. Show your work.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

AP MICROECONOMICS • EXERCISE SHEET

2.6 Market Equilibrium and Consumer and Producer Surplus

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS surplus 过剩 • equilibrium 均衡 • consumer surplus 消费者剩余 • producer surplus 生产者剩余 • allocative efficiency 配置效率

Objective

Build the skills to answer exam questions on **market equilibrium and consumer and producer surplus**.

You must be able to:

- determine the **equilibrium price** and **quantity** where demand meets supply
- calculate **consumer surplus** 消费者剩余 and **producer surplus** 生产者剩余
- define **total surplus** 总剩余 and explain **allocative efficiency** 配置效率

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Surplus areas

- **Consumer surplus** = area **below** the demand curve and **above** the price (what buyers gain).
- **Producer surplus** = area **above** the supply curve and **below** the price (what sellers gain).

■ Allocative efficiency

Total surplus (CS + PS) is greatest at the competitive equilibrium, where **marginal benefit** equals **marginal cost** — the allocatively efficient quantity.

2 Practice

2.1 Define consumer surplus. [1]

2.2 Define producer surplus. [1]

2.3 A good sells at \$10; a buyer was willing to pay \$16. Find the consumer surplus on that unit. [1]

3 Exam-style questions

3.1 Consumer surplus is the area [1]

- **A** above the demand curve
- **B** below demand and above the price
- **C** below the supply curve
- **D** above the price and below supply

3.2 A competitive market is allocatively efficient where [1]

- **A** $MB > MC$
- **B** $MB = MC$
- **C** $MB < MC$
- **D** the price is zero

3.3 In a market, the equilibrium price is \$8. On one trade, the seller would accept \$5 and the buyer would pay \$12.

(a) Find the producer surplus on that trade. [1]

(b) Find the consumer surplus. [1]

(c) Find the total surplus. [1]

Solutions

2.1 the difference between what buyers are willing to pay and what they actually pay.

2.2 the difference between the price sellers receive and the lowest they would accept.

2.3 $16 - 10 = \$6$.

3.1 B.

3.2 B.

3.3 (a) $8 - 5 = \$3$. (b) $12 - 8 = \$4$. (c) $3 + 4 = \$7$.

3. In Gurkeland, the domestic market for cucumbers is characterized by a downward-sloping demand curve and an upward-sloping supply curve, and the market for cucumbers is currently in equilibrium at a price of $20 per bushel.

Part A

Draw a correctly labeled graph of the market for cucumbers and show the equilibrium price, labeled $20, and the equilibrium quantity, labeled Q_1.

Part B

Suppose that Gurkeland engages in free trade with other countries and that the world price of cucumbers is $10 per bushel.

i. On your graph in part A, show the world price of cucumbers, labeled $10, and the quantity of cucumbers sold by domestic producers, labeled Q_2.

ii. Will total economic surplus in Gurkeland increase, decrease, or remain the same after engaging in free trade?

Part C

Now suppose that the government of Gurkeland imposes a $5 tariff per bushel on the import of cucumbers.

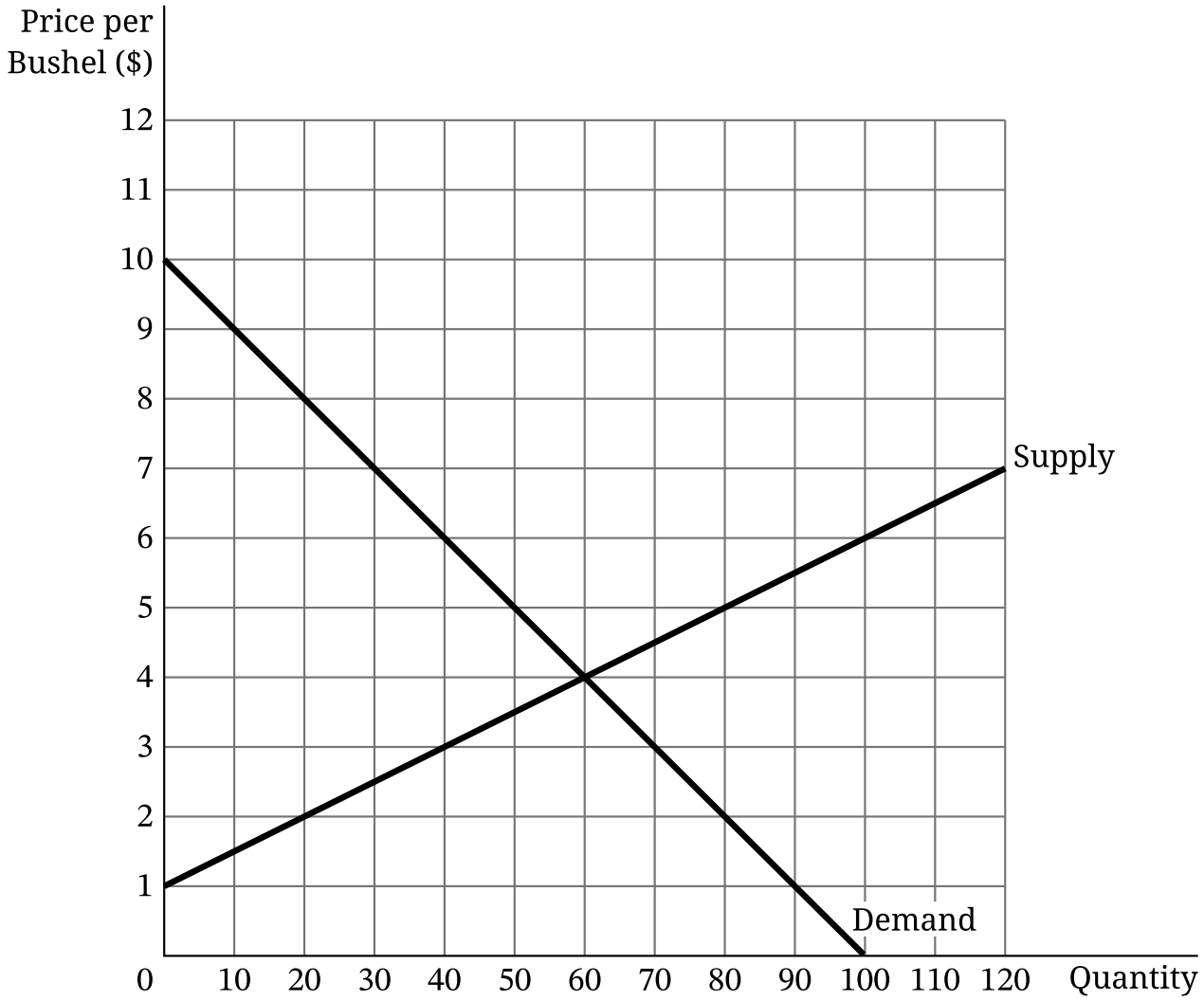
i. On your graph in part A, show the new quantity of cucumbers, labeled Q_3, that will be sold by domestic producers as a result of the $5 tariff imposed on the import of cucumbers.

ii. As compared with the free trade described in part B, will domestic producer surplus in the market for cucumbers increase, decrease, or remain the same as a result of the $5 tariff imposed on the import of cucumbers? Explain.

STOP

END OF EXAM

2. The graph provided shows the market for rice in the country of Rushland.



A. Calculate the total economic surplus at market equilibrium. Show your work.

B. If the government sets a price floor at $3 per bushel, will there be a surplus, a shortage, or neither? Explain.

C. Suppose that instead of the price floor, Rushland engages in international trade and the world price of rice is $5 per bushel.

i. Will Rushland export or import rice? Explain using numbers from the graph.

ii. Calculate the domestic consumer surplus when Rushland engages in international trade. Show your work.

iii. Calculate the total revenue that Rushland's farmers will earn at the world price. Show your work.

1. Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

A. Draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward and show each of the following.

i. The market equilibrium price and quantity, labeled P_M and Q_M, respectively

ii. Deskward's profit-maximizing price and quantity, labeled P_F and Q_F, respectively

iii. Deskward's average total cost curve consistent with long-run equilibrium, labeled ATC

B. If the monthly rent, a fixed cost, on Deskward's factory building increases, what will happen to the firm's profit-maximizing quantity in the short run? Explain.

C. Suppose the government is considering granting a per-unit subsidy to producers of wooden desks. On your market graph in part A, show the short-run effect of a per-unit subsidy on each of the following.

i. The new market equilibrium price and quantity of wooden desks, labeled P* and Q*, respectively

ii. The area representing the total cost of the subsidy to the government, shaded completely

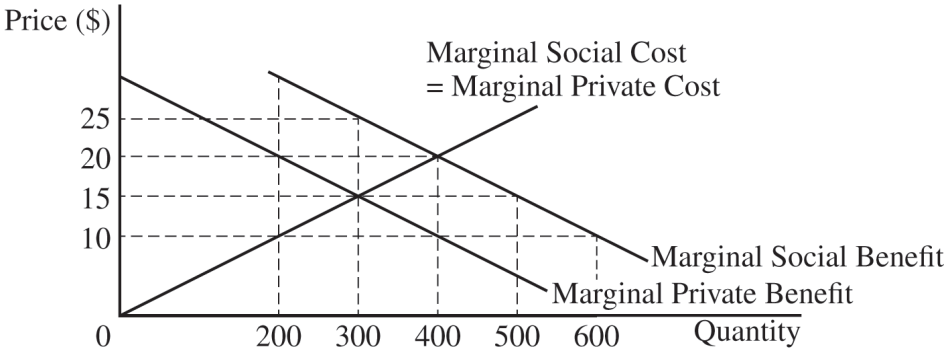
D. Instead of the per-unit subsidy, suppose the government imposes a binding price floor in the market for wooden desks. Will the price floor result in a shortage of wooden desks, a surplus of wooden desks, or neither? Explain.

E. Deskward also produces chairs. Deskward increases its production from 500 chairs to 600 chairs, and its long-run total cost increases from $80,000 to $108,000.

i. Calculate Deskward's long-run average total cost of producing 500 chairs. Show your work.

ii. As Deskward increases production from 500 chairs to 600 chairs, is Deskward experiencing economies of scale, diseconomies of scale, or the efficient scale? Explain using numbers.

2. Good X is produced and sold in a perfectly competitive market. The provided graph shows the market for Good X.



(a) Identify the market equilibrium price and quantity.

(b) Calculate the deadweight loss at the market equilibrium. Show your work.

(c) Suppose the government wants to eliminate the deadweight loss in the market for Good X.

(i) Which of the following will achieve the government's objective: a per-unit tax on consumers or a per-unit subsidy to consumers? Explain.

(ii) What is the dollar value of the per-unit tax or per-unit subsidy identified in part (c)(i) ?

(d) Suppose instead the government imposes a price ceiling of $10. Will the price ceiling achieve the socially optimal quantity of Good X? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

1. Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

   (a) Draw a correctly labeled graph for Arzeye Pharma and show each of the following.

   (i) The profit-maximizing quantity of eye treatments, labeled Q^*
   (ii) The profit-maximizing price, labeled P^*
   (iii) The average total cost curve consistent with positive economic profit, labeled ATC
   (iv) The area representing consumer surplus, shaded completely

   (b) Suppose Arzeye Pharma wants to charge a price that maximizes its total revenue rather than its profit.

   (i) On your graph in part (a), show the revenue-maximizing quantity, labeled Q_R.
   (ii) At quantity Q_R identified in part (b)(i), is the demand for eye treatments elastic, inelastic, or unit elastic?

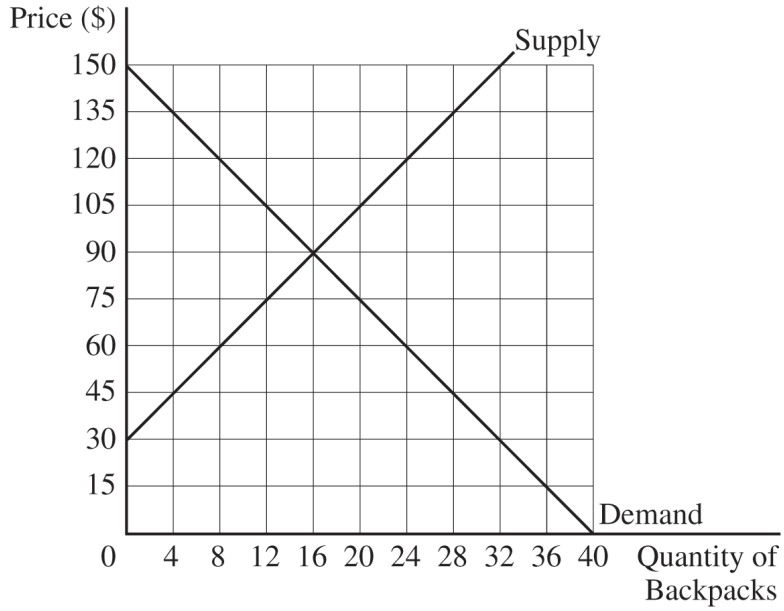
   (c) Suppose now that Arzeye Pharma engages in perfect price discrimination.

   (i) On your graph in part (a), show the lowest price that Arzeye Pharma would charge, labeled P_2.
   (ii) What would happen to consumer surplus? Explain.

   (d) Suppose instead that Arzeye Pharma's patent expires. Will the demand for Arzeye Pharma's treatment become more elastic, become less elastic, or not change? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. Backpacks are produced in a perfectly competitive market that has no externalities. The provided graph shows the market supply and demand curves for backpacks in the country of Jambo.



(a) Calculate total economic surplus at the market equilibrium. Show your work.

(b) To decrease the price of backpacks for students, the government of Jambo has decided to set a price ceiling of $60 per backpack. Compared to the market equilibrium, will the quantity of backpacks purchased increase, decrease, or not change as a result of the price ceiling? Explain.

(c) Suppose instead the government of Jambo provides a per-unit subsidy of $30 to the sellers of backpacks.

(i) Identify the price paid by consumers per backpack after the per-unit subsidy is implemented.
(ii) Calculate the total cost of the subsidy to the government. Show your work.
(iii) Does the per-unit subsidy cause deadweight loss to increase, decrease, or remain the same compared to the market equilibrium in part (a)? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM

1. A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.

   (a) Draw a correctly labeled graph for the firm and show each of the following.

   (i) The quantity of carbon-capture devices produced by the firm, labeled Q_M
   (ii) The price charged by the firm, labeled P_M
   (iii) The area representing consumer surplus, shaded completely

   (b) The government is considering different options to regulate the firm.

   (i) Suppose the government is considering taxing the firm. Could using a per-unit tax change the firm's output to the socially optimal quantity? Explain.
   (ii) Instead, suppose the government imposes a price ceiling so that the firm produces the socially optimal quantity. On your graph in part (a), label the quantity and price after the price ceiling is imposed as Q_C and P_C.
   (iii) At the price and the quantity identified in part (b)(ii), is the firm earning positive economic profit? Explain.

   (c) Assume the government decides not to regulate the firm and instead the firm produces the quantity of output that maximizes total revenue.

   (i) If the firm now increases its output by one unit, would marginal revenue be positive, negative, or zero? Explain.
   (ii) Starting at the total-revenue-maximizing quantity, if the firm reduces the price by 10%, would the quantity demanded increase by less than 10%, by more than 10%, or by exactly 10% ?

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. In the local market for Good X, there are four individual buyers: Emily, Wu, Omar, and Fernanda. The quantities that each individual buyer would be willing and able to purchase at different prices are included in the table provided.

	Quantity of Good X			
Price	Emily	Wu	Omar	Fernanda
$1	5	4	4	3
$2	4	3	4	3
$3	4	3	3	2
$4	3	2	3	2
$5	3	2	2	1
$6	2	1	2	1
$7	2	1	1	0
$8	1	0	1	0

(a) The local market for Good X has a perfectly elastic supply. Draw a correctly labeled graph for the local market for Good X with a market equilibrium price of $5. Label the equilibrium price as $5, and label the equilibrium quantity for the market with a specific value based on the data provided in the table.

(b) Assume the cost of production increases, which causes the price of Good X to increase from $5 to $7.

(i) Calculate the price elasticity of demand for Good X as the price increases from $5 to $7. Show your work.

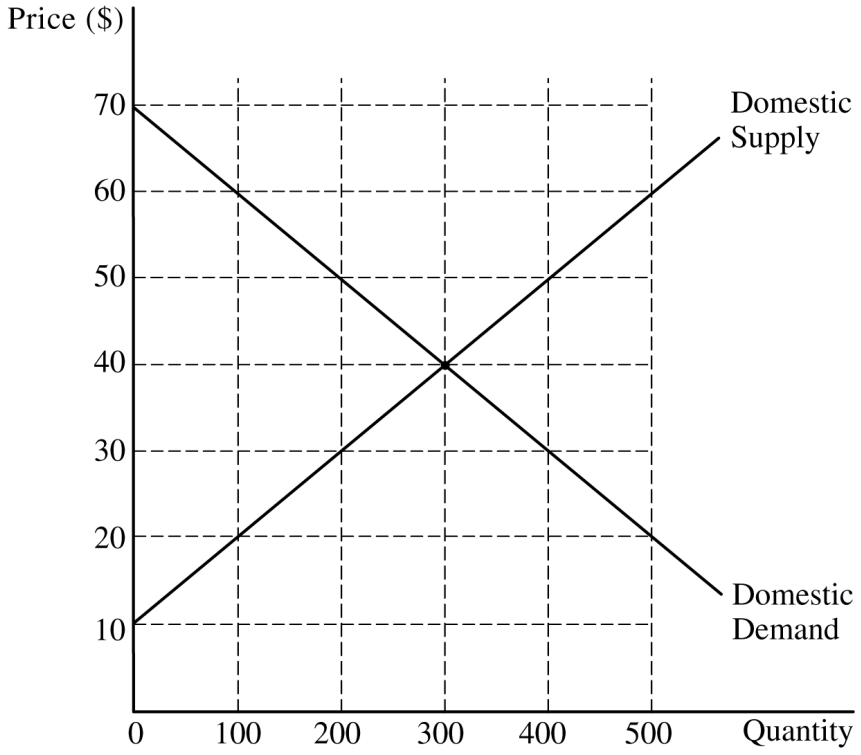
(ii) Identify whether the demand for Good X is elastic, inelastic, or unit elastic in that range of prices.

(c) Could Emily's marginal benefit for the second unit of Good X equal $4.50 ? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM



2. The graph provided depicts New Zealand's domestic supply and demand for wool.

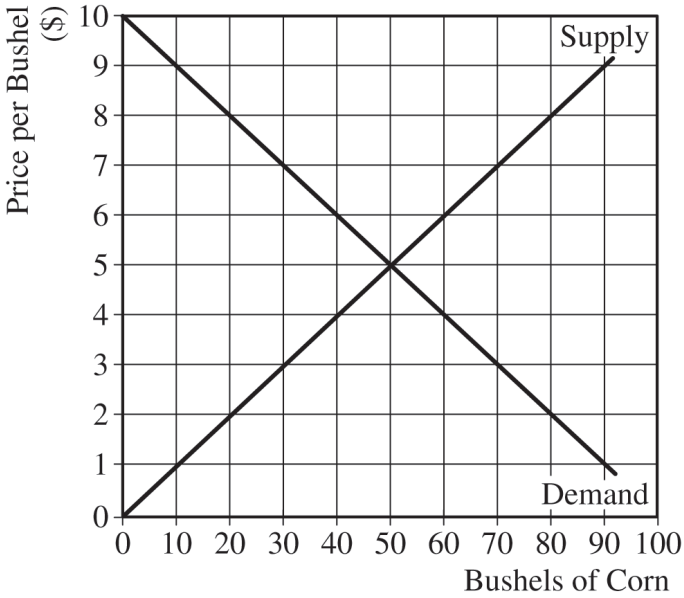
(a) Calculate the consumer surplus if New Zealand does not trade with the rest of the world. Show your work.

(b) Instead, assume New Zealand decides to trade wool in the world market. The current world price of wool is $60 per unit, and New Zealand is a price taker in the world market.

(i) How many units of wool will New Zealand export?
(ii) What will happen to the consumer surplus of wool consumers in New Zealand when New Zealand begins to trade with the rest of the world? Explain.
(iii) Will total economic surplus in New Zealand increase, decrease, or remain unchanged when New Zealand begins to trade wool in the world market? Explain using numbers.

(c) Now assume domestic demand in New Zealand increases. Will New Zealand's exports increase, decrease, or stay the same?

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.



3. The diagram above shows the market for corn in the country of Microland. Corn is produced and sold in a constant-cost, perfectly competitive market.

   (a) Calculate the total revenue earned by corn farmers at the market equilibrium price. Show your work.

   (b) In an attempt to assist corn farmers in Microland, the government sets a $7 price floor on corn.

   (i) How many bushels of corn will be exchanged at the price floor?
   (ii) Calculate the deadweight loss associated with the price floor. Show your work.
   (iii) Assume the government agrees to buy the unsold quantity at $7. Calculate the producer surplus. Show your work.
   (iv) Assume the price floor and the government buying program remain in effect. In addition, assume the demand for corn does not change. In the long run, will the quantity of corn purchased by the government increase, decrease, or remain the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

STOP

END OF EXAM

2. The following is a table showing Dana's marginal benefit from purchasing bottles of water and good X from a grocery store.

Quantity of Water (in bottles)	Marginal Benefit of Water (in dollars)		Quantity of Good X (in units)	Marginal Benefit of Good X (in dollars)
1	24		1	24
2	18		2	18
3	12		3	12
4	6		4	6
5	3		5	3

(a) What is Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X? Show your work.

(b) Assume the price of a unit of good X is $5. Calculate the total consumer surplus if Dana purchases 3 units of good X. Show your work.

(c) Now assume the price of a bottle of water is $3 and the price of a unit of good X is $6. Dana spends her entire budget of $30 on bottles of water and good X.

(i) Explain why Dana does not maximize her benefit when she purchases 2 bottles of water and 4 units of good X. Use marginal analysis to explain your answer.

(ii) What are the optimal quantities of good X and bottles of water at these prices?

(iii) Suppose the price of a unit of good X drops to $3. Calculate Dana's cross-price elasticity of demand for bottles of water with respect to the price of good X, and state whether the two goods are substitutes or complements. Show your work.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

AP MICROECONOMICS • EXERCISE SHEET

2.7 Market Disequilibrium and Changes in Equilibrium

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS surplus 过剩 • shortage 短缺 • equilibrium 均衡 • demand 需求 • supply 供给

Objective

Build the skills to answer exam questions on **market disequilibrium and changes in equilibrium**.

You must be able to:

- explain how a price above equilibrium creates a **surplus** 过剩 and below creates a **shortage** 短缺
- predict the new equilibrium after a **shift** in demand or supply
- analyse a **simultaneous shift** and identify the **indeterminate** outcome

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Surplus and shortage

A price **above** equilibrium leaves a **surplus** (price falls back); a price **below** leaves a **shortage** (price rises back).

■ Single shifts

- Demand **right** → price up, quantity up.
- Supply **right** → price down, quantity up.

■ Simultaneous shifts

When **both** curves shift, one of price or quantity is clear and the **other is indeterminate** (depends on the relative sizes of the shifts).

2 Practice

2.1 State what happens at a price above the equilibrium price. [1]

2.2 State the effect of an increase in supply on equilibrium price and quantity. [2]

2.3 State what makes an equilibrium outcome indeterminate. [1]

3 Exam-style questions

3.1 A price below equilibrium creates a [1]

- **A** surplus
- **B** shortage
- **C** new equilibrium
- **D** tax

3.2 If demand rises and supply falls at the same time, the change in equilibrium **quantity** is [1]

- **A** definitely up
- **B** definitely down
- **C** indeterminate
- **D** always zero

3.3 In a market, demand increases.

(a) State the effect on the equilibrium price. [1]

(b) State the effect on the equilibrium quantity. [1]

(c) If supply **also** rises at the same time, state which variable becomes indeterminate. [1]

Solutions

2.1 a surplus forms and the price falls back toward equilibrium.

2.2 the price falls and the quantity rises.

2.3 when both curves shift, so the effect on one variable depends on the relative sizes of the shifts.

3.1 B.

3.2 C — price definitely rises, but quantity is indeterminate.

3.3 (a) it rises. (b) it rises. (c) the price becomes indeterminate.

1. Soja Farm is a typical profit-maximizing firm that produces and sells soybeans in a constant-cost, perfectly competitive market that is in long-run equilibrium. The market equilibrium price of soybeans is $14 per bushel.

(a) Draw correctly labeled side-by-side graphs for the soybean market and for Soja Farm, and show each of the following.

(i) The market equilibrium price and quantity, labeled $14 and Q_M, respectively
(ii) Soja Farm's profit-maximizing price and quantity, labeled P_F and Q_F, respectively
(iii) Soja Farm's average total cost curve consistent with a long-run equilibrium, labeled ATC

(b) If Soja Farm is the only firm in the market that chooses to increase its price of soybeans to $15 per bushel, will Soja Farm's total revenue increase by $1, remain the same, or decrease to $0 ? Explain.

(c) Soybeans are used as an input in the production of tofu. Tofu now becomes a more popular food option among consumers. On your graphs in part (a), show the short-run effect of the increased popularity of tofu on each of the following.

(i) The new market equilibrium price and quantity of soybeans, labeled P_2 and Q_2, respectively
(ii) Soja Farm's new profit-maximizing quantity, labeled Q*

(d) Given the increase in popularity of tofu in part (c), what will happen to the number of firms in the soybean market in the long run? Explain.

(e) Suppose a 25% increase in the market price of quinoa causes a 5% decrease in the quantity demanded of quinoa and a 10% increase in the quantity demanded for tofu.

(i) Is the demand for quinoa elastic, inelastic, or unit elastic? Explain using numbers.
(ii) Calculate the cross-price elasticity of demand between quinoa and tofu. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

1. Sugar is produced in a perfectly competitive market using inputs from perfectly competitive factor markets. Frank Sugar Co. is a representative firm in the sugar market.

(a) Assume Frank Sugar Co. is earning zero economic profit. Draw correctly labeled side-by-side graphs for the sugar market and Frank Sugar Co. and show each of the following.

(i) The market equilibrium price and quantity, labeled P_M and Q_M, respectively
(ii) The profit-maximizing price and quantity for Frank Sugar Co., labeled P_F and Q_F, respectively

(b) Assume the demand for sugar increases and sugar is produced in a constant-cost industry.

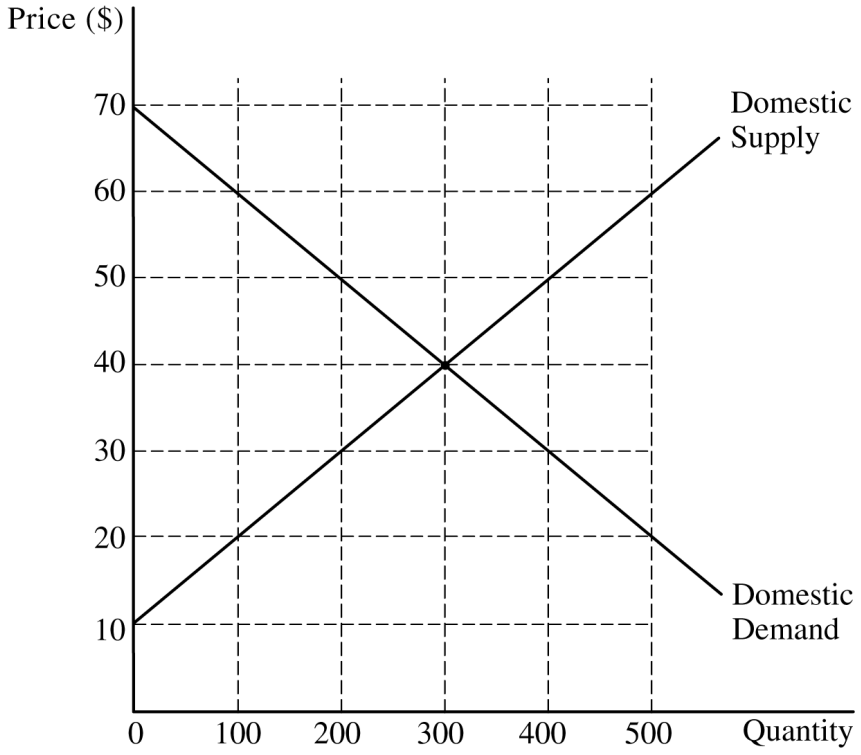
(i) On your graph in part (a), show the short-run effect of the increased demand for sugar on the market price, labeled P_2, and the quantity sold by Frank Sugar Co., labeled Q_N.
(ii) Compared to the equilibrium identified in part (a)(ii), what will happen to the short-run profit earned by Frank Sugar Co. as a result of the increased demand for sugar?
(iii) When the market adjusts to long-run equilibrium, how will the market price of sugar in the long run compare to P_2 ? Explain.

(c) Instead, assume sugar consumption has a negative impact on public health over time and the negative impact of sugar on health is underestimated by consumers. Draw a correctly labeled graph of the market, with the marginal social benefit (MSB), marginal private benefit (MPB), marginal social cost (MSC), and marginal private cost (MPC) curves, and show each of the following.

(i) The market equilibrium quantity, labeled Q_M
(ii) The socially optimal quantity, labeled Q_S

(d) Assume the government decides to intervene in the market to affect consumers' incentives and to address the negative impact of sugar consumption on public health. Which of the following policies would best achieve that objective in the short run: a lump-sum tax, a per-unit tax, a lump-sum subsidy, or a per-unit subsidy? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.



2. The graph provided depicts New Zealand's domestic supply and demand for wool.

(a) Calculate the consumer surplus if New Zealand does not trade with the rest of the world. Show your work.

(b) Instead, assume New Zealand decides to trade wool in the world market. The current world price of wool is $60 per unit, and New Zealand is a price taker in the world market.

(i) How many units of wool will New Zealand export?
(ii) What will happen to the consumer surplus of wool consumers in New Zealand when New Zealand begins to trade with the rest of the world? Explain.
(iii) Will total economic surplus in New Zealand increase, decrease, or remain unchanged when New Zealand begins to trade wool in the world market? Explain using numbers.

(c) Now assume domestic demand in New Zealand increases. Will New Zealand's exports increase, decrease, or stay the same?

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.
   (a) Draw correctly labeled side-by-side graphs for the corn market and a representative corn farmer. On your graphs show each of the following.
      (i) The equilibrium price and quantity in the corn market, labeled P_M and Q_M, respectively
      (ii) The profit-maximizing quantity of corn produced by the representative farmer earning zero economic profit, labeled Q_F
   (b) Assume the demand for ethanol increases. On your graphs in part (a) show what will happen to each of the following in the short run.
      (i) The market price and quantity of corn, labeled P^* and Q^*
      (ii) The area of the profit or loss earned by the representative corn farmer, shaded completely
   (c) Relative to your answer in part (b), state what will happen to the market equilibrium price and quantity of corn in the long run. Explain.
   (d) Soybeans are produced in a perfectly competitive market. Assume farmers can grow either corn or soybeans on the same land. What happens to the price of soybeans in the next planting season if the price of corn increases? Explain.
   (e) Assume instead that the government sets a binding price ceiling in the corn market. Draw a new correctly labeled graph for the corn market and show each of the following.
      (i) The binding price ceiling, labeled P_c
      (ii) The quantity purchased by consumers in the corn market, labeled Q_p

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

2.8 The Effects of Government Intervention in Markets

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS price floor 价格下限 • price ceiling 价格上限 • deadweight loss 无谓损失 • per-unit tax 从量税 • tax incidence 税负归宿

Objective

Build the skills to answer exam questions on **the effects of government intervention in markets**.

You must be able to:

- analyse a **price ceiling** 价格上限 and a **price floor** 价格下限
- show how a binding price control creates a **deadweight loss** 无谓损失
- analyse the impact of a **per-unit tax** 从量税 on price, quantity, and revenue
- explain how **tax incidence** 税负归宿 depends on relative elasticities

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Price controls

A **binding ceiling** (below equilibrium) causes a **shortage**; a **binding floor** (above equilibrium) causes a **surplus**. Both reduce total surplus, creating a **deadweight loss**.

■ A per-unit tax

Raises the price buyers pay, lowers the price sellers keep, and **reduces the quantity** traded; the gap is government revenue.

■ Tax incidence

The **more inelastic** side of the market bears the **larger** share of the tax.

2 Practice

2.1 State the effect of a binding price ceiling. [1]

2.2 State who bears more of a tax: the more elastic or the more inelastic side. [1]

2.3 A $2 per-unit tax is placed on a good. State its effect on the price buyers pay and the quantity traded. [2]

3 Exam-style questions

3.1 A binding price floor causes a [1]

- **A** shortage
- **B** surplus
- **C** higher quantity traded
- **D** no change

3.2 A per-unit tax creates a [1]

- **A** gain in total surplus
- **B** deadweight loss
- **C** shortage
- **D** subsidy

3.3 A per-unit tax is placed on a good with very **inelastic** demand.

(a) State who bears most of the tax. [1]

(b) State the effect on the quantity traded. [1]

(c) Name the loss of total surplus that the tax creates. [1]

Solutions

2.1 it causes a shortage (quantity demanded exceeds quantity supplied).

2.2 the more inelastic side.

2.3 the price buyers pay rises and the quantity traded falls.

3.1 B.

3.2 B.

3.3 (a) buyers (demand is more inelastic). (b) it falls only a little. (c) deadweight loss.

3. In Gurkeland, the domestic market for cucumbers is characterized by a downward-sloping demand curve and an upward-sloping supply curve, and the market for cucumbers is currently in equilibrium at a price of $20 per bushel.

Part A

Draw a correctly labeled graph of the market for cucumbers and show the equilibrium price, labeled $20, and the equilibrium quantity, labeled Q_1.

Part B

Suppose that Gurkeland engages in free trade with other countries and that the world price of cucumbers is $10 per bushel.

i. On your graph in part A, show the world price of cucumbers, labeled $10, and the quantity of cucumbers sold by domestic producers, labeled Q_2.

ii. Will total economic surplus in Gurkeland increase, decrease, or remain the same after engaging in free trade?

Part C

Now suppose that the government of Gurkeland imposes a $5 tariff per bushel on the import of cucumbers.

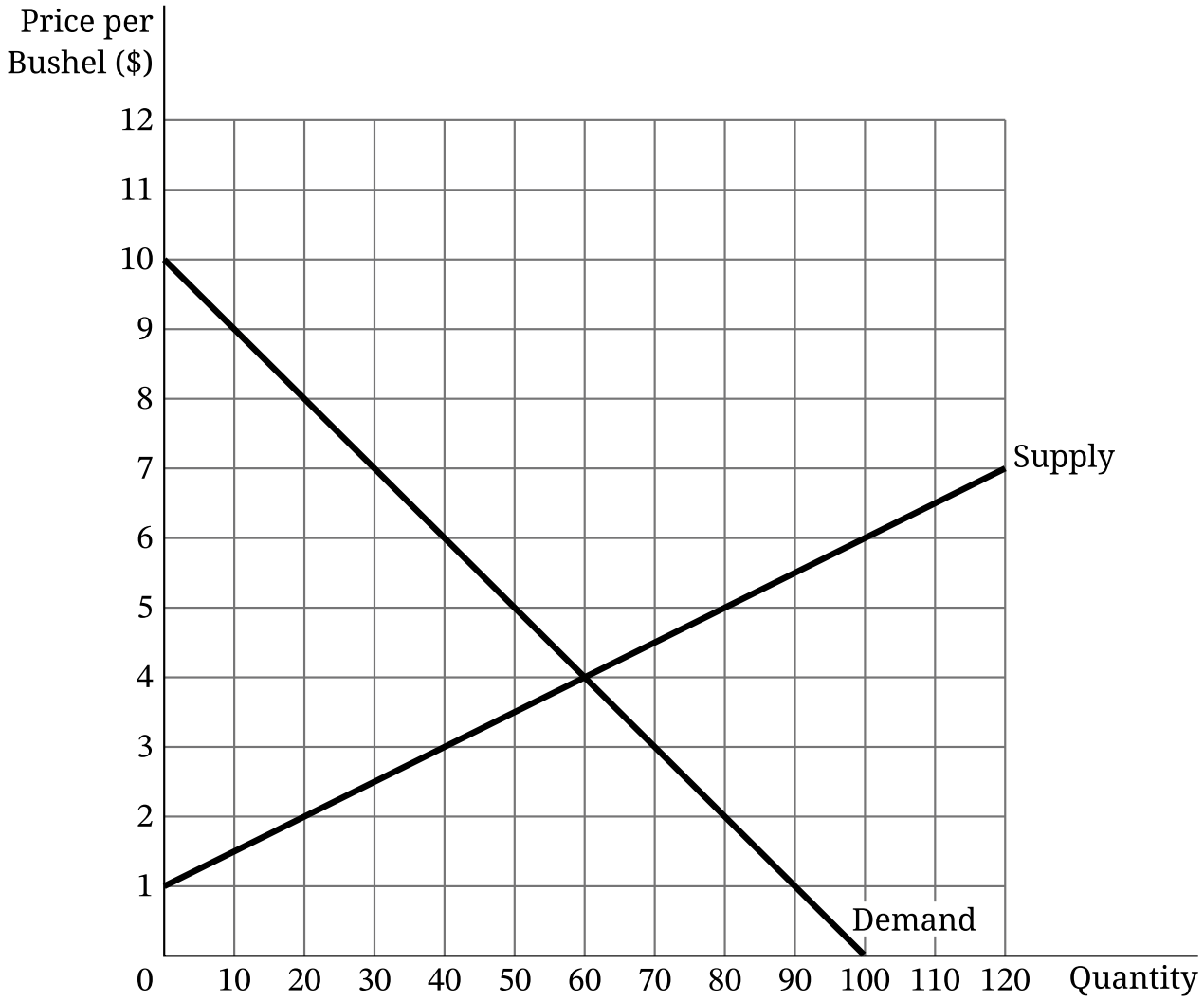
i. On your graph in part A, show the new quantity of cucumbers, labeled Q_3, that will be sold by domestic producers as a result of the $5 tariff imposed on the import of cucumbers.

ii. As compared with the free trade described in part B, will domestic producer surplus in the market for cucumbers increase, decrease, or remain the same as a result of the $5 tariff imposed on the import of cucumbers? Explain.

STOP

END OF EXAM

2. The graph provided shows the market for rice in the country of Rushland.



A. Calculate the total economic surplus at market equilibrium. Show your work.

B. If the government sets a price floor at $3 per bushel, will there be a surplus, a shortage, or neither? Explain.

C. Suppose that instead of the price floor, Rushland engages in international trade and the world price of rice is $5 per bushel.

i. Will Rushland export or import rice? Explain using numbers from the graph.

ii. Calculate the domestic consumer surplus when Rushland engages in international trade. Show your work.

iii. Calculate the total revenue that Rushland's farmers will earn at the world price. Show your work.

1. Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

A. Draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward and show each of the following.

i. The market equilibrium price and quantity, labeled P_M and Q_M, respectively

ii. Deskward's profit-maximizing price and quantity, labeled P_F and Q_F, respectively

iii. Deskward's average total cost curve consistent with long-run equilibrium, labeled ATC

B. If the monthly rent, a fixed cost, on Deskward's factory building increases, what will happen to the firm's profit-maximizing quantity in the short run? Explain.

C. Suppose the government is considering granting a per-unit subsidy to producers of wooden desks. On your market graph in part A, show the short-run effect of a per-unit subsidy on each of the following.

i. The new market equilibrium price and quantity of wooden desks, labeled P* and Q*, respectively

ii. The area representing the total cost of the subsidy to the government, shaded completely

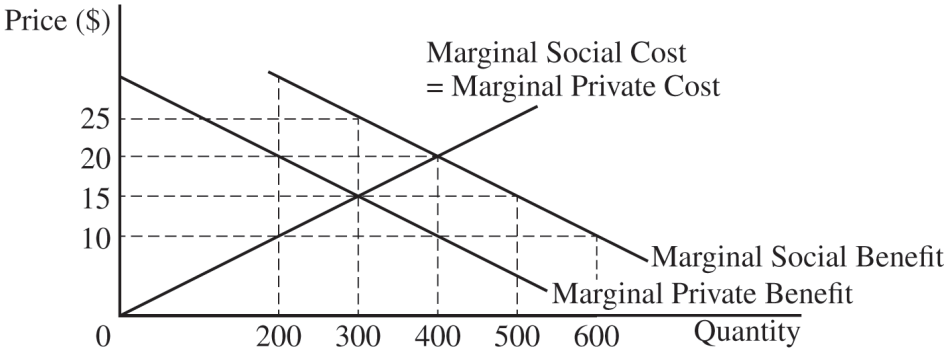
D. Instead of the per-unit subsidy, suppose the government imposes a binding price floor in the market for wooden desks. Will the price floor result in a shortage of wooden desks, a surplus of wooden desks, or neither? Explain.

E. Deskward also produces chairs. Deskward increases its production from 500 chairs to 600 chairs, and its long-run total cost increases from $80,000 to $108,000.

i. Calculate Deskward's long-run average total cost of producing 500 chairs. Show your work.

ii. As Deskward increases production from 500 chairs to 600 chairs, is Deskward experiencing economies of scale, diseconomies of scale, or the efficient scale? Explain using numbers.

2. Good X is produced and sold in a perfectly competitive market. The provided graph shows the market for Good X.



(a) Identify the market equilibrium price and quantity.

(b) Calculate the deadweight loss at the market equilibrium. Show your work.

(c) Suppose the government wants to eliminate the deadweight loss in the market for Good X.

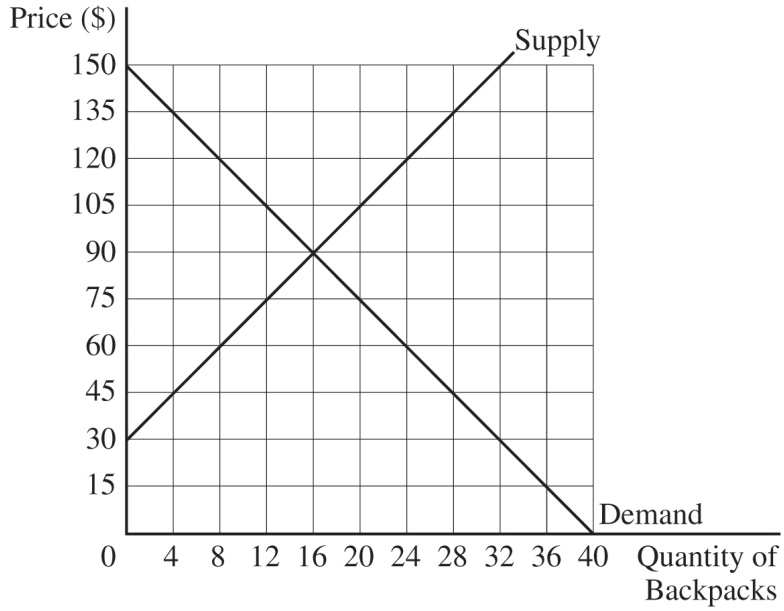
(i) Which of the following will achieve the government's objective: a per-unit tax on consumers or a per-unit subsidy to consumers? Explain.

(ii) What is the dollar value of the per-unit tax or per-unit subsidy identified in part (c)(i) ?

(d) Suppose instead the government imposes a price ceiling of $10. Will the price ceiling achieve the socially optimal quantity of Good X? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

3. Backpacks are produced in a perfectly competitive market that has no externalities. The provided graph shows the market supply and demand curves for backpacks in the country of Jambo.



(a) Calculate total economic surplus at the market equilibrium. Show your work.

(b) To decrease the price of backpacks for students, the government of Jambo has decided to set a price ceiling of $60 per backpack. Compared to the market equilibrium, will the quantity of backpacks purchased increase, decrease, or not change as a result of the price ceiling? Explain.

(c) Suppose instead the government of Jambo provides a per-unit subsidy of $30 to the sellers of backpacks.

(i) Identify the price paid by consumers per backpack after the per-unit subsidy is implemented.
(ii) Calculate the total cost of the subsidy to the government. Show your work.
(iii) Does the per-unit subsidy cause deadweight loss to increase, decrease, or remain the same compared to the market equilibrium in part (a)? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

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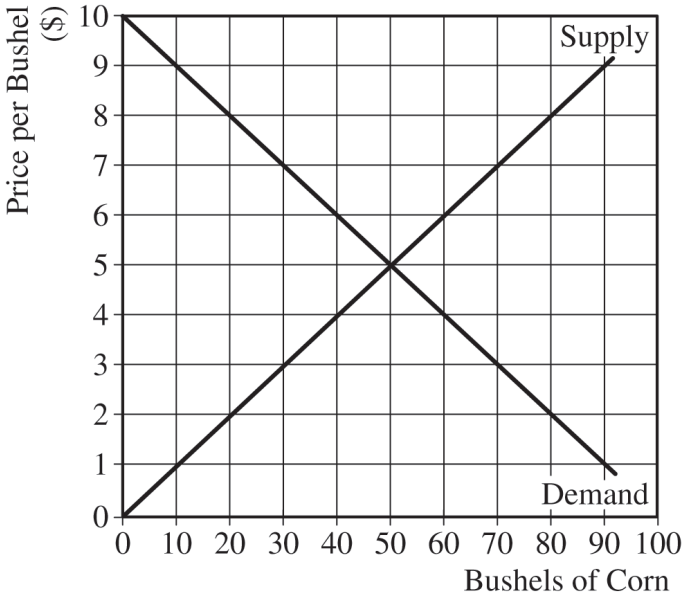
END OF EXAM



3. The diagram above shows the market for corn in the country of Microland. Corn is produced and sold in a constant-cost, perfectly competitive market.

   (a) Calculate the total revenue earned by corn farmers at the market equilibrium price. Show your work.

   (b) In an attempt to assist corn farmers in Microland, the government sets a $7 price floor on corn.

   (i) How many bushels of corn will be exchanged at the price floor?
   (ii) Calculate the deadweight loss associated with the price floor. Show your work.
   (iii) Assume the government agrees to buy the unsold quantity at $7. Calculate the producer surplus. Show your work.
   (iv) Assume the price floor and the government buying program remain in effect. In addition, assume the demand for corn does not change. In the long run, will the quantity of corn purchased by the government increase, decrease, or remain the same? Explain.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

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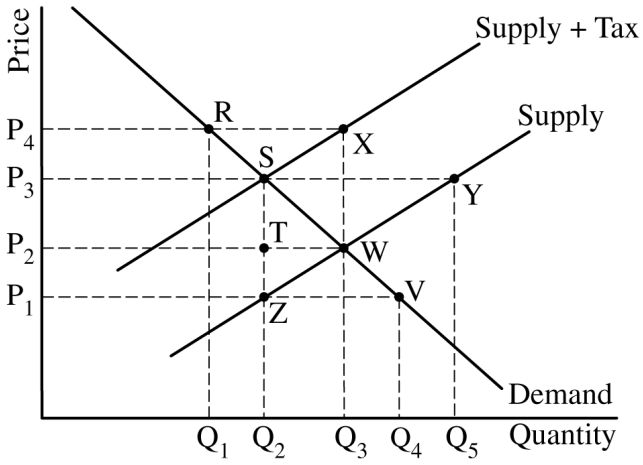
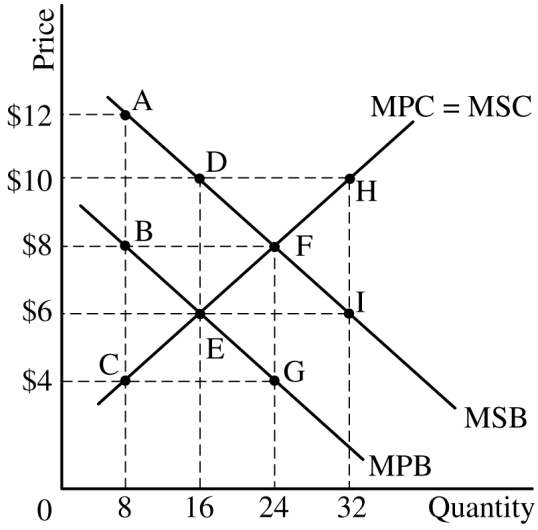


2. Hats are produced in a perfectly competitive industry, and the government imposes a per-unit sales tax on hats.
   (a) Using the labeling from the graph, identify each of the following.
      (i) The after-tax price paid by consumers and the after-tax quantity
      (ii) The area representing the total tax revenue received by the government
   (b) Now assume instead that the demand for hats is perfectly inelastic at Q_3, while the supply and the per-unit tax remain unchanged.
      (i) Will the after-tax price paid by consumers be higher, lower, or the same compared to the price in your answer to part (a)(i) ?
      (ii) Will the total tax revenue received by the government be higher, lower, or the same compared to the tax revenue in your answer to part (a)(ii) ? Explain.
   (c) If the demand for hats remains perfectly inelastic at Q_3 and the per-unit sales tax is reduced, will producer surplus increase, decrease, or stay the same? Explain.

2. Modern-day word processing software gives consumers the ability to create and save documents in different file formats that can then be accessed by multiple computer operating systems. The graph below depicts a perfectly competitive market for word processing software. In the graph, MSB is the marginal social benefit, MPB is the marginal private benefit, MPC is the marginal private cost, and MSC is the marginal social cost.



(a) Identify the type of market failure illustrated by the graph. Explain.

(b) Using the numbers on the graph, identify the market equilibrium price and quantity.

(c) Using the labeling on the graph, identify the area representing the deadweight loss at the quantity identified in part (b).

(d) Suppose the government is considering granting a subsidy to correct the market failure. What is the dollar value of the per-unit subsidy that would achieve the socially optimal quantity?

(e) Suppose the government does not grant the subsidy and instead imposes a price floor at $8.

(i) How many units will consumers and producers exchange at the price floor?

(ii) Does the price floor correct the market failure? Explain.

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. Corn is used as food and as an input in the production of ethanol, an alternative fuel. Assume corn is produced in a perfectly competitive market.
   (a) Draw correctly labeled side-by-side graphs for the corn market and a representative corn farmer. On your graphs show each of the following.
      (i) The equilibrium price and quantity in the corn market, labeled P_M and Q_M, respectively
      (ii) The profit-maximizing quantity of corn produced by the representative farmer earning zero economic profit, labeled Q_F
   (b) Assume the demand for ethanol increases. On your graphs in part (a) show what will happen to each of the following in the short run.
      (i) The market price and quantity of corn, labeled P^* and Q^*
      (ii) The area of the profit or loss earned by the representative corn farmer, shaded completely
   (c) Relative to your answer in part (b), state what will happen to the market equilibrium price and quantity of corn in the long run. Explain.
   (d) Soybeans are produced in a perfectly competitive market. Assume farmers can grow either corn or soybeans on the same land. What happens to the price of soybeans in the next planting season if the price of corn increases? Explain.
   (e) Assume instead that the government sets a binding price ceiling in the corn market. Draw a new correctly labeled graph for the corn market and show each of the following.
      (i) The binding price ceiling, labeled P_c
      (ii) The quantity purchased by consumers in the corn market, labeled Q_p

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

   (a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

   (i) Would the price floor result in a shortage, a surplus, or neither? Explain.

   (ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

   (iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

   (b) Bananas are an input for muffins.

   (i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

   (ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

   (iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

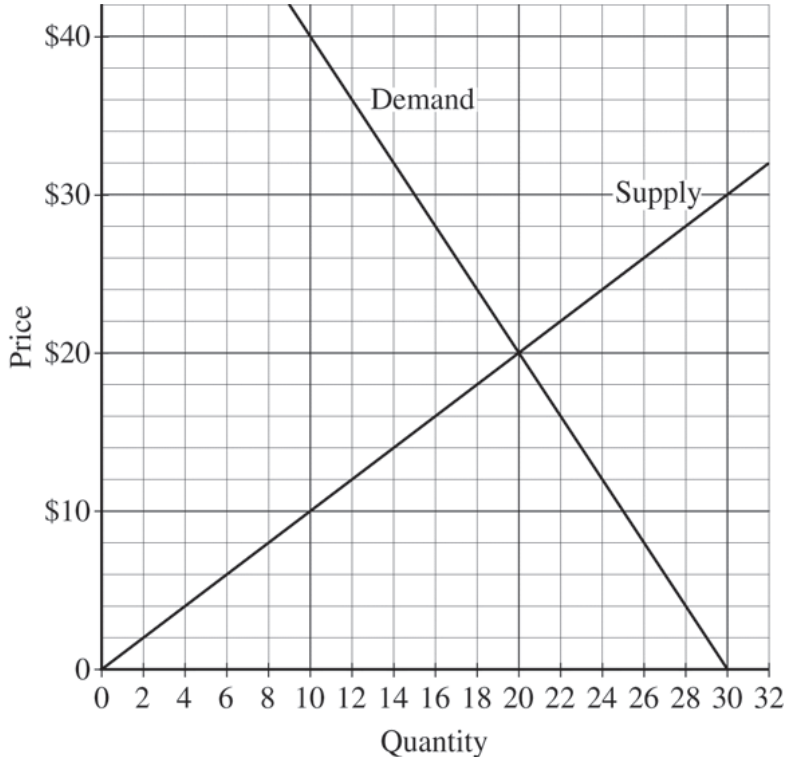
   (c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

   (i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

   (ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

   (iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

3. The graph below shows the market for widgets. The government is considering intervening in this market.



(a) Calculate the total producer surplus at the market equilibrium price and quantity. Show your work.

(b) If the government imposes a price floor at $16, is there a shortage, a surplus, or neither? Explain.

(c) If instead the government imposes a price ceiling at $12, is there a shortage, a surplus, or neither? Explain.

(d) If instead the government restricts the market output to 10 units, calculate the deadweight loss. Show your work.

(e) Assume the price decreases from $20 to $12.
   (i) Calculate the price elasticity of demand. Show your work.
   (ii) In this price range, is demand perfectly elastic, relatively elastic, unit elastic, relatively inelastic, or perfectly inelastic?

STOP

END OF EXAM

(c) Now assume that the monopolist produces 10 units. Using the numbers given in the graph, calculate each of the following. Show your work.

(i) The monopolist's economic profit

(ii) The consumer surplus

(iii) The deadweight loss

(d) At what quantity is demand unit elastic?

(e) Suppose the monopolist perfectly price discriminates and chooses the quantity that maximizes profit. Determine the dollar value of each of the following.

(i) The monopolist's profit

(ii) The consumer surplus

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2. Ray's Stable hires workers in a perfectly competitive factor market for unskilled labor.

(a) Using correctly labeled side-by-side graphs for the labor market and Ray's Stable, show each of the following.

(i) The equilibrium wage and quantity for unskilled labor, labeled W_E and Q_E, respectively

(ii) The wage paid by Ray's Stable and the quantity of unskilled labor hired, labeled W_R and Q_R, respectively

(b) Is the marginal factor cost of unskilled labor for Ray's Stable greater than, less than, or equal to W_E? Explain.

(c) Now assume that the government imposes an effective minimum wage for unskilled labor.

(i) Show the minimum wage on your graphs in part (a), labeled W_{MIN}.

(ii) On the labor market graph in part (a), show the quantity of unskilled labor supplied in the labor market as a result of the minimum wage, labeled Q_S.

(iii) As a result of the new minimum wage, will the marginal revenue product of the last worker hired by Ray's Stable increase, decrease, or stay the same?

AP MICROECONOMICS • EXERCISE SHEET

2.9 International Trade and Public Policy

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS world price 世界价格 • tariff 关税 • exports 出口 • imports 进口 • autarky 自给自足

Objective

Build the skills to answer exam questions on **international trade and public policy**.

You must be able to:

- compare a market under **autarky** 自给自足 with one open to trade at the **world price** 世界价格
- explain how a country becomes an **importer** or **exporter**
- analyse how a **tariff** 关税 and an **import quota** 进口配额 affect price, quantity, and deadweight loss

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Importer or exporter

Compare the **world price** with the domestic (autarky) price:

- world price **below** domestic → the country **imports**;
- world price **above** domestic → the country **exports**.

■ Free trade

Free trade **raises total surplus**; when importing, consumers gain more than producers lose.

■ Trade barriers

A **tariff** or **quota** raises the domestic price, cuts imports, and creates a **deadweight loss**.

2 Practice

2.1 State when a country becomes an importer of a good. [1]

2.2 State the effect of a tariff on the domestic price of an imported good. [1]

2.3 State the effect of free trade on total surplus. [1]

3 Exam-style questions

3.1 A country imports a good when the world price is _____ the domestic price. [1]

- **A** above
- **B** below
- **C** equal to
- **D** unrelated to

3.2 A tariff on imports [1]

- **A** raises total surplus
- **B** creates a deadweight loss
- **C** lowers the domestic price
- **D** increases imports

3.3 The world price of steel is below a country's domestic price.

(a) State whether the country imports or exports steel. [1]

(b) State the effect of free trade on domestic consumers. [1]

(c) State the effect of a tariff on the quantity imported. [1]

Solutions

2.1 when the world price is below the domestic (autarky) price.

2.2 it raises it.

2.3 it raises total surplus.

3.1 B.

3.2 B.

3.3 (a) it imports steel. (b) they gain (they pay the lower world price). (c) it reduces the quantity imported.

3. In Gurkeland, the domestic market for cucumbers is characterized by a downward-sloping demand curve and an upward-sloping supply curve, and the market for cucumbers is currently in equilibrium at a price of $20 per bushel.

Part A

Draw a correctly labeled graph of the market for cucumbers and show the equilibrium price, labeled $20, and the equilibrium quantity, labeled Q_1.

Part B

Suppose that Gurkeland engages in free trade with other countries and that the world price of cucumbers is $10 per bushel.

i. On your graph in part A, show the world price of cucumbers, labeled $10, and the quantity of cucumbers sold by domestic producers, labeled Q_2.

ii. Will total economic surplus in Gurkeland increase, decrease, or remain the same after engaging in free trade?

Part C

Now suppose that the government of Gurkeland imposes a $5 tariff per bushel on the import of cucumbers.

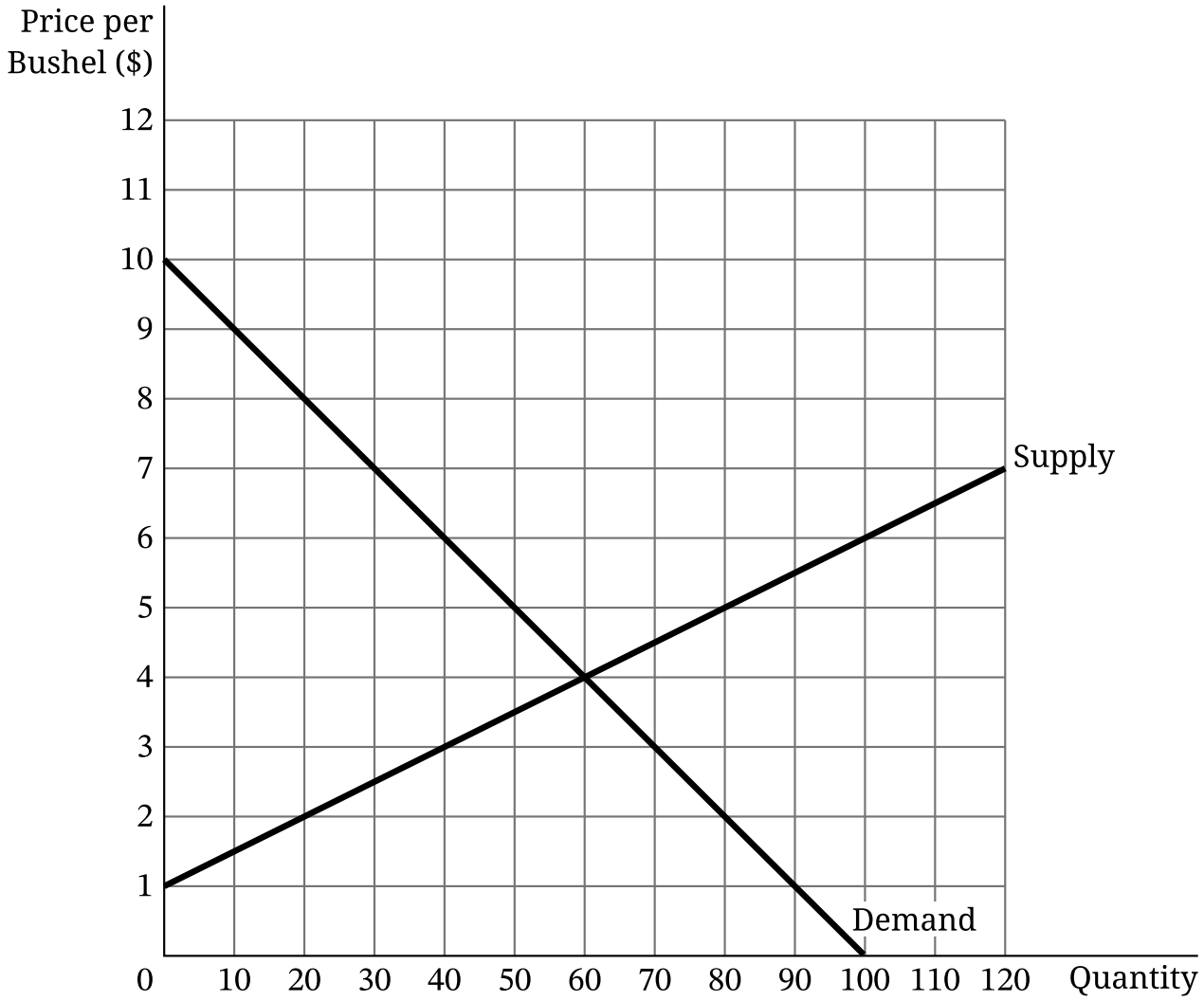
i. On your graph in part A, show the new quantity of cucumbers, labeled Q_3, that will be sold by domestic producers as a result of the $5 tariff imposed on the import of cucumbers.

ii. As compared with the free trade described in part B, will domestic producer surplus in the market for cucumbers increase, decrease, or remain the same as a result of the $5 tariff imposed on the import of cucumbers? Explain.

STOP

END OF EXAM

2. The graph provided shows the market for rice in the country of Rushland.



A. Calculate the total economic surplus at market equilibrium. Show your work.

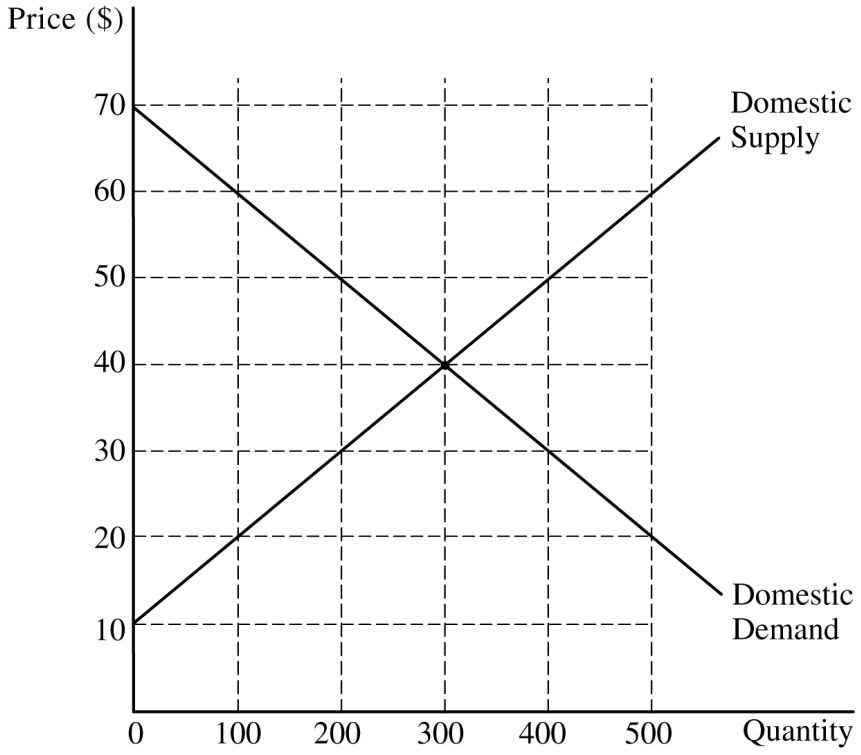
B. If the government sets a price floor at $3 per bushel, will there be a surplus, a shortage, or neither? Explain.

C. Suppose that instead of the price floor, Rushland engages in international trade and the world price of rice is $5 per bushel.

i. Will Rushland export or import rice? Explain using numbers from the graph.

ii. Calculate the domestic consumer surplus when Rushland engages in international trade. Show your work.

iii. Calculate the total revenue that Rushland's farmers will earn at the world price. Show your work.



2. The graph provided depicts New Zealand's domestic supply and demand for wool.

(a) Calculate the consumer surplus if New Zealand does not trade with the rest of the world. Show your work.

(b) Instead, assume New Zealand decides to trade wool in the world market. The current world price of wool is $60 per unit, and New Zealand is a price taker in the world market.

(i) How many units of wool will New Zealand export?
(ii) What will happen to the consumer surplus of wool consumers in New Zealand when New Zealand begins to trade with the rest of the world? Explain.
(iii) Will total economic surplus in New Zealand increase, decrease, or remain unchanged when New Zealand begins to trade wool in the world market? Explain using numbers.

(c) Now assume domestic demand in New Zealand increases. Will New Zealand's exports increase, decrease, or stay the same?

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.