HOLIDAY HOMEWORK 假期作业

AP Microeconomics

Exercise sheets and past-paper practice, topic by topic.
每个单元：练习卷 + 历年真题。

For class or self-study • no answer keys included.

Contents 目录

1 Scarcity, choice, and opportunity cost – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
scarcity	稀缺性			
opportunity cost	机会成本			
production possibilities curve (PPC)	生产可能性曲线			

Recall

Economics is about choices you already make:

- You cannot have everything – your money and time are limited.
- Picking one thing means giving up another.
- Making more of one thing can mean making less of another.

This sheet lines up the core ideas. Each idea has a worked example.

New ideas

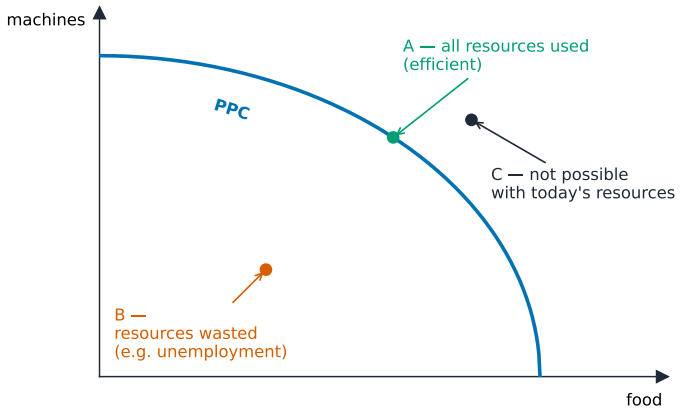
1 Scarcity and opportunity cost

Economics begins with **scarcity** 稀缺性: wants are unlimited, but resources are limited. Every choice has an **opportunity cost** 机会成本 – the value of the next-best thing you gave up.

Worked example. If you spend $20 and an afternoon on a concert instead of a $60 shift, the opportunity cost is the $60 you did not earn (plus the $20 ticket).

2 The production possibilities curve

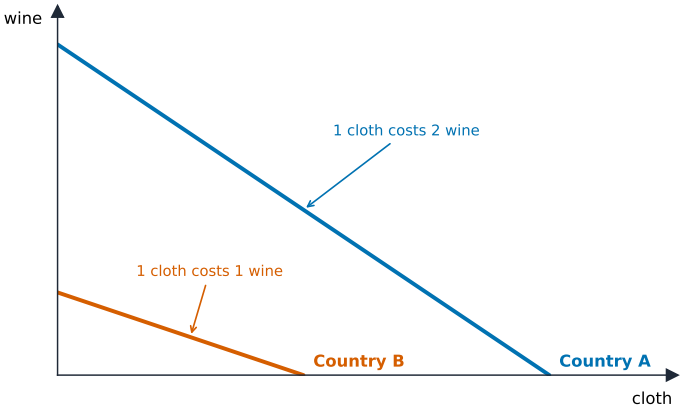
The **production possibilities curve (PPC)** 生产可能性曲线 shows the most of two goods an economy can make with resources fully used.



- **on** the curve = efficient; **inside** = wasteful; **outside** = impossible.
- Its downward slope shows opportunity cost: making more of one good means less of the other.

3 Comparative advantage

A producer has a **comparative advantage** in a good if it can make it at a **lower opportunity cost**. Producers should specialize where they have it, then trade.



Watch out: money already spent and unrecoverable is a **sunk cost** – ignore it when

deciding what to do next. Only future costs and benefits should affect a choice.

Practice

Try these in order. The methods are all above.

2.1 State what scarcity means and why it forces choices. [2]

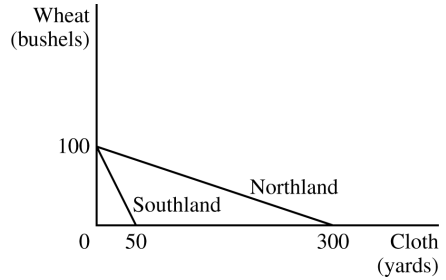
2.2 You give up a \$40 shift to study. State the opportunity cost of studying. [1]

2.3 On a PPC, state what a point outside the curve represents. [1]

2.4 Explain what a comparative advantage is. [2]

2.5 You have already paid \$10 for a film ticket but now feel too tired to enjoy it. Explain why the \$10 should not affect your decision to go. [2]

2. The graph shows the production possibilities curves for Northland and Southland.



(a) Which country has a comparative advantage in producing wheat? Explain using numbers.

(b) Identify a specific number of yards of cloth that could be traded for 10 bushels of wheat and would be mutually beneficial to Northland and Southland.

(c) Southland's maximum possible output of wheat falls from 100 bushels to 75 bushels. Assuming no other changes, will Southland have a comparative advantage in producing cloth? Explain using numbers.

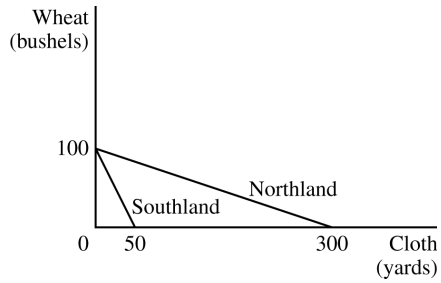
(d) Turnips are produced in a perfectly competitive market in Alderia, a third country, which does not engage in international trade. Runoff from turnip fields pollutes Alderia's rivers, hurting its residents.

(i) Does the turnip market equilibrium result in an efficient allocation of resources? Explain using marginal analysis.

(ii) In an effort to reduce pollution, Alderia's government imposes a lump-sum tax on turnip production. What will be the impact on the turnip market equilibrium price and quantity in the short run?

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 shows the production possibilities curves for Northland and Southland.



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1 Marginal analysis and consumer choice – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Marginal analysis	边际分析			
marginal benefit	边际收益			
marginal cost	边际成本			
Utility	效用			
diminishing marginal utility	边际效用递减			

Recall

Most real choices are not "all or nothing" but "a little more or a little less":

- Should I study one more hour, or take a break?
- Should I buy one more snack?
- The first slice of pizza is great; the fifth, not so much.

This sheet lines up how economists make "one more" decisions. Each idea has a worked example.

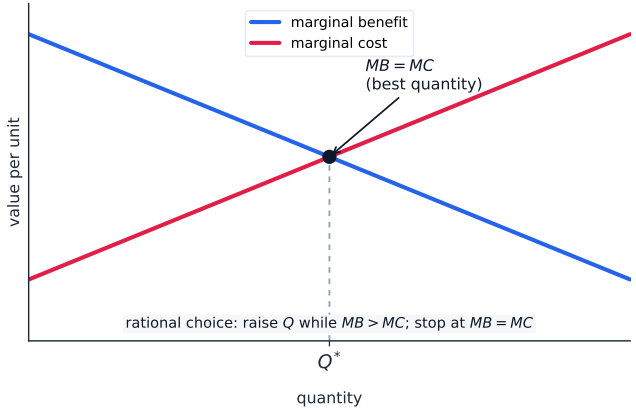
New ideas

1 Marginal analysis

Marginal analysis 边际分析 compares the **marginal benefit** 边际收益 (the benefit of one more unit) with the **marginal cost** 边际成本 (the cost of one more unit).

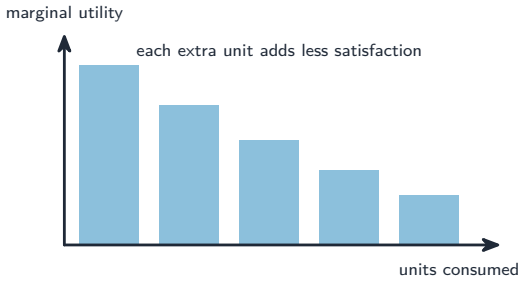
2 The decision rule

Keep doing the activity while marginal benefit is **greater** than marginal cost, and stop where they are **equal** ($MB = MC$). That point gives the most net benefit.



3 Diminishing marginal utility

Utility 效用 is the satisfaction you get from a good. Each extra unit usually gives **less** added satisfaction – the law of **diminishing marginal utility** 边际效用递减.



Worked example. The first glass of water on a hot day is worth a lot; the fourth is worth much less – its marginal utility has fallen.

4 Getting the best value

A shopper gets the most satisfaction by spending so that the **satisfaction per dollar** is equal across all goods. If one good gives more satisfaction per dollar, buy more of it.

Watch out: the decision rule is $MB = MC$ – stop where they are **equal**, not where benefit is highest. Going past $MB = MC$ adds units that cost more than they are worth.

Practice

Try these in order. The methods are all above.

2.1 State what marginal benefit and marginal cost mean. [2]

2.2 State the rule for the best amount of an activity to do. [1]

2.3 Explain the law of diminishing marginal utility, with an example. [2]

2.4 An activity has marginal benefit \$8 and marginal cost \$5 for the next unit. State whether you should do it, and why. [2]

2.5 Explain why you should stop where marginal benefit equals marginal cost, not where benefit is highest. [2]

3. Nirali is a student at the University of Ainsley. She has 5 hours to study for two exams today. The tables below show Nirali's expected scores given the amount of time she studies for each exam.

Number of Hours Spent Studying Microeconomics	Expected Score on Microeconomics Exam (100-point scale)
5	100
4	96
3	90
2	82
1	60
0	0

Number of Hours Spent Studying History	Expected Score on History Exam (100-point scale)
0	0
1	40
2	60
3	72
4	77
5	80

(a) Nirali spends 3 hours studying microeconomics and 2 hours studying history. Calculate her gain from the second hour spent studying history.

(b) Calculate Nirali's opportunity cost of the second hour spent studying history.

(c) Assume Nirali increases the time she allocates to studying history. What happens to the opportunity cost of studying history? Explain.

(d) Assume that Nirali has a goal of maximizing the sum of her test scores (the score on microeconomics plus the score on history). How many hours should she study for each exam?

(e) Nirali learns that her tennis practice has been canceled, freeing up an additional hour for studying. Given your answer to part (d), will Nirali allocate the additional hour to studying microeconomics or to studying history to maximize the sum of her test scores? Explain using marginal analysis.

STOP

END OF EXAM

2. Martha has a fixed budget of $20, and she spends it all on two goods, X and Y. The price of X is $4 per unit, and the price of Y is $2 per unit. The table below shows the total benefit, measured in dollars, Martha receives from the consumption of each good.

Quantity of X	Total Benefit from X	Quantity of Y	Total Benefit from Y
0	$0	0	$0
1	$16	1	$10
2	$28	2	$18
3	$36	3	$24
4	$40	4	$28
5	$41	5	$30

(a) What is Martha's marginal benefit of the fifth unit of good X?

(b) Calculate the total consumer surplus if Martha consumes 5 units of X. Show your work.

(c) Martha is currently consuming 4 units of X and 2 units of Y. Use marginal analysis to explain why this combination is not optimal for Martha.

(d) What is Martha's optimal combination of goods X and Y?

(e) Indicate whether each of the following will cause the optimal quantity of good Y to increase, decrease, or stay the same.

(i) The price of good Y doubles.
(ii) Martha's income falls to $10 with no changes in prices.
(iii) Martha's income doubles, and the price of both goods double.

2 Demand, supply, and surplus – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Demand	需求			
supply	供给			
Equilibrium	均衡			
Consumer surplus	消费者剩余			
Producer surplus	生产者剩余			

Recall

You have seen prices respond to buyers and sellers:

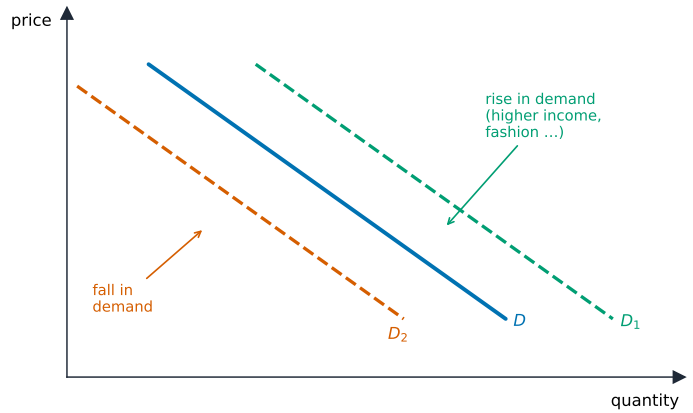
- Popular goods tend to cost more.
- When shops have too much stock, they cut prices.
- A market price is where buyers and sellers agree.

This sheet lines up demand, supply, and market equilibrium. Each idea has a worked example.

New ideas

1 Demand and supply

Demand 需求 slopes **downward** (buyers buy less as price rises); **supply** 供给 slopes **upward** (sellers offer more as price rises).

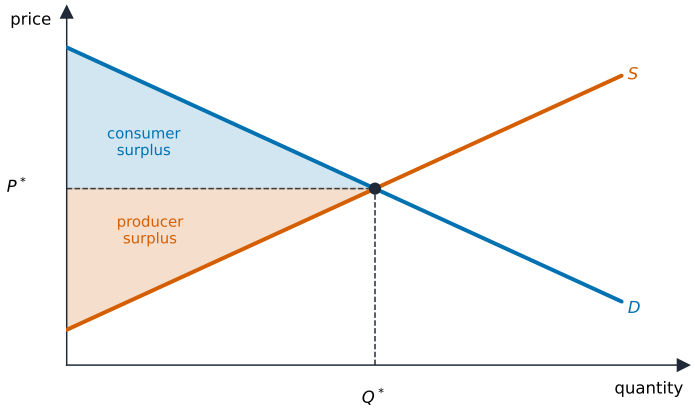


2 Equilibrium

Equilibrium 均衡 is where supply meets demand – the price that clears the market. Above it there is a surplus (price falls); below it a shortage (price rises).

3 Consumer and producer surplus

- **Consumer surplus** 消费者剩余 is the gap between what buyers would pay and what they do pay.
- **Producer surplus** 生产者剩余 is the gap between the price and sellers' lowest acceptable price.



■ 4 Shifts

If a determinant (income, tastes, costs) changes, a curve shifts. A rightward demand shift raises both price and quantity; a rightward supply shift lowers price but raises quantity.

Watch out: the competitive equilibrium **maximizes** total surplus (consumer plus producer). That is why free markets are called efficient – they leave no mutually beneficial trade undone.

Practice

Try these in order. The methods are all above.

2.1 State the direction each of the demand and supply curves slopes. [2]

2.2 State what happens to price above the equilibrium, and why. [2]

2.3 Explain what consumer surplus is. [2]

2.4 A rise in income shifts demand right. State what happens to equilibrium price and quantity. [2]

2.5 State what the competitive equilibrium does to total surplus. [1]

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

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

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. 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

2 Elasticity and government intervention – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Price elasticity of demand	需求价格弹性			
elastic	富有弹性			
inelastic	缺乏弹性			
price ceiling	价格上限			
price floor	价格下限			

Recall

In Part A you met supply and demand. Now two more ideas:

- Some goods barely change in demand when the price changes; others swing a lot.
- Governments sometimes set maximum or minimum prices.

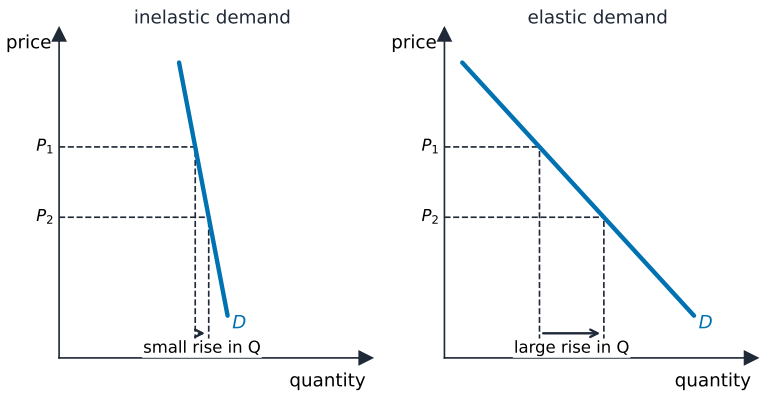
Each idea has a worked example before the Practice.

New ideas

1 Price elasticity of demand

Price elasticity of demand 需求价格弹性 measures how strongly quantity responds to a price change:

$$E_d = \left| \frac{\%\ \Delta \text{ quantity}}{\%\ \Delta \text{ price}} \right|.$$



- $E_d > 1$ is **elastic** 富有弹性 (quantity responds strongly),
- $E_d < 1$ is **inelastic** 缺乏弹性 (quantity barely responds).

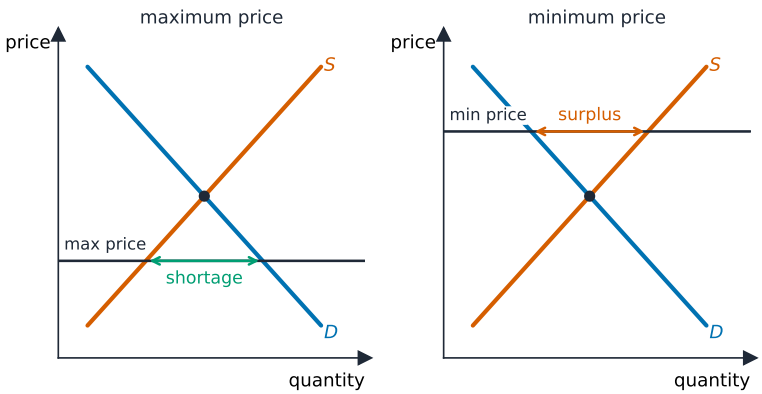
Worked example. If a 10% price rise cuts quantity by 5%, then $E_d = \dfrac{5\%}{10\%} = 0.5$ – inelastic.

2 What makes demand elastic

Demand is more elastic when there are more substitutes, the good is a luxury, or buyers have more time to adjust.

3 Price controls

- A **price ceiling** 价格上限 (a legal maximum, below equilibrium) causes a **shortage**.
- A **price floor** 价格下限 (a legal minimum, above equilibrium) causes a **surplus**.



Watch out: an elasticity below 1 still means demand **does** respond – just weakly. "Inelastic" does not mean "no response", only a small one.

Practice

Try these in order. The methods are all above.

2.1 State what price elasticity of demand measures. [1]

2.2 A 20% price rise cuts quantity demanded by 10%. Find the elasticity and state whether it is elastic or inelastic. [3]

2.3 State one thing that makes a good's demand more elastic. [1]

2.4 State what a price ceiling below equilibrium causes, and why. [2]

2.5 State what a price floor above equilibrium (like a minimum wage) causes. [2]

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. 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. 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

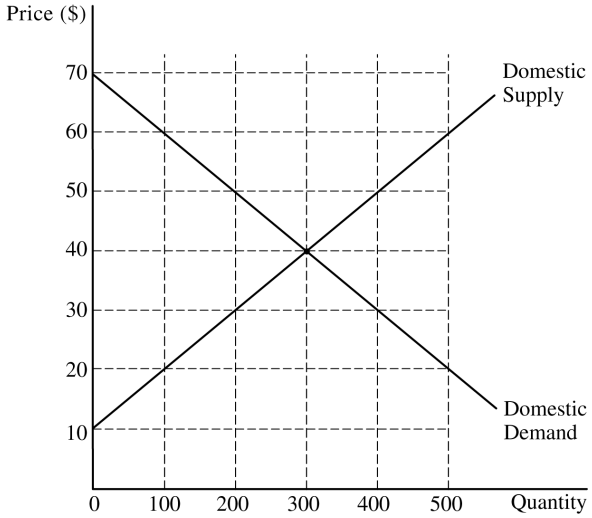
ii. The area representing the total cost of the subsidy to the government, shaded completely

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. 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 A firm's costs – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
Fixed cost	固定成本			
Variable cost	可变成本			
Economies of scale	规模经济			

Recall

Businesses have to think about costs:

- Some costs stay the same however much you make (rent).
- Other costs rise as you produce more (materials).
- Making things in bulk can lower the cost per item.

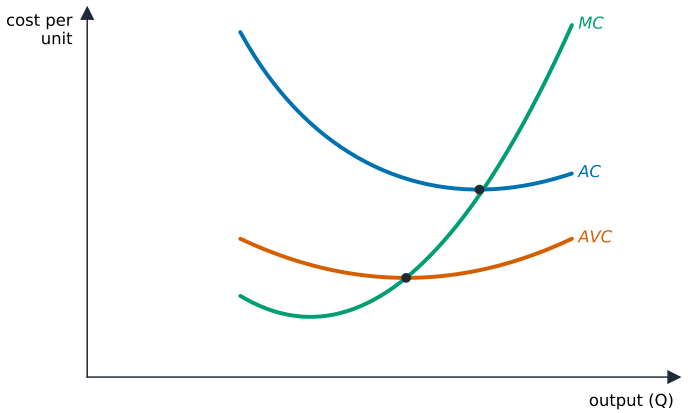
This sheet lines up a firm's costs. Each idea has a worked example.

New ideas

1 Fixed and variable costs

- **Fixed cost** 固定成本 does not change with output (rent on the factory).
- **Variable cost** 可变成本 rises with output (materials, labour).
- Total cost = fixed + variable.

2 Per-unit costs

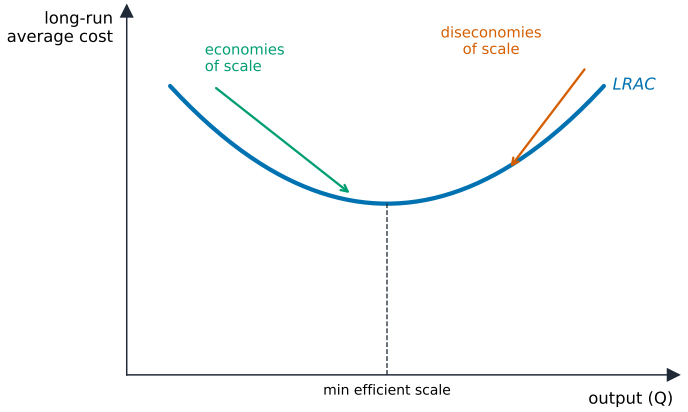


- **Average total cost (ATC)** = total cost ÷ quantity.
- **Marginal cost (MC)** = the cost of making one **more** unit.

Worked example. If total cost is \$300 for 10 units, $ATC = \frac{300}{10} = \$30$. If making an 11th unit raises total cost to \$325, the marginal cost of that unit is \$25.

3 Economies of scale

Economies of scale 规模经济 mean the average cost **falls** as the firm grows – through bulk buying and specialization.



■ 4 Diseconomies of scale

If a firm grows too big to manage well, average cost can start to **rise** again – diseconomies of scale.

Watch out: marginal cost is the cost of the **next** unit, not the average cost. A firm decides whether to make one more unit by looking at its marginal cost, not the average.

Practice

Try these in order. The methods are all above.

2.1 State the difference between a fixed cost and a variable cost, with an example of each. [2]

2.2 A firm's total cost for 5 units is \$200. Find the average total cost. [2]

2.3 Making a 6th unit raises total cost from \$200 to \$236. Find the marginal cost of that unit. [2]

2.4 Explain what economies of scale are. [2]

2.5 State one reason a very large firm might face rising average costs. [1]

2. The table below shows the output a firm produces using different amounts of capital (K) and labor (L). The markets for capital and labor are perfectly competitive. The rental rate of capital is \$75 per unit, and the wage rate is \$200 per unit. In the short run, capital is fixed and labor is variable.

Labor	Output with K=1	Output with K=2
0	0	0
1	10	20
2	25	50
3	38	75

(a) If the firm uses one unit of capital and one unit of labor, will it be operating with constant, increasing, or decreasing returns to scale? Explain using numbers from the table.

(b) Assume now that the firm currently has two units of capital and is using three units of labor.

(i) Calculate the marginal product for the third unit of labor. Show your work.

(ii) Did the firm experience diminishing marginal returns with the addition of the third unit of labor? Explain using numbers from the table.

(iii) Calculate the firm's average total cost for its current level of production. Show your work.

(iv) If the firm's output is sold in a competitive market, what is the lowest output price at which the third unit of labor would be hired?

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(i) Calculate the marginal product for the third unit of labor. Show your work.

(ii) Did the firm experience diminishing marginal returns with the addition of the third unit of labor? Explain using numbers from the table.

(iii) Calculate the firm's average total cost for its current level of production. Show your work.

(iv) If the firm's output is sold in a competitive market, what is the lowest output price at which the third unit of labor would be hired?

3. Camden's Cakery is one of many dessert cafés serving a local community. Each café produces a slightly differentiated product, there are no barriers to entry or exit, and the firm is in long-run equilibrium.

(a) Draw a correctly labeled graph showing Camden's demand curve, marginal revenue curve, marginal cost curve, and long-run average total cost curve. Label Camden's profit-maximizing output Q_m and its price P_m.

(b) On your graph in part (a), label the output at which total revenue is maximized Q_R.

(c) Do firms in this market experience economies of scale, diseconomies of scale, or neither in long-run equilibrium? Explain.

STOP

END OF EXAM

3 Profit and perfect competition – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
marginal revenue	边际收益			
Economic profit	经济利润			
Perfect competition	完全竞争			

Recall

In Part A you met a firm's costs. Now how much it should make, and what "profit" really means:

- A firm wants to make the most profit it can.
- Profit is what is left after paying costs.
- But economists count the cost of missed opportunities too.

Each idea has a worked example before the Practice.

New ideas

1 Profit maximization

Every firm makes the most profit at the quantity where **marginal revenue** 边际收益 (the extra revenue from one more unit) equals **marginal cost**:

$$MR = MC.$$

Make each unit whose revenue beats its cost; stop where they are equal.

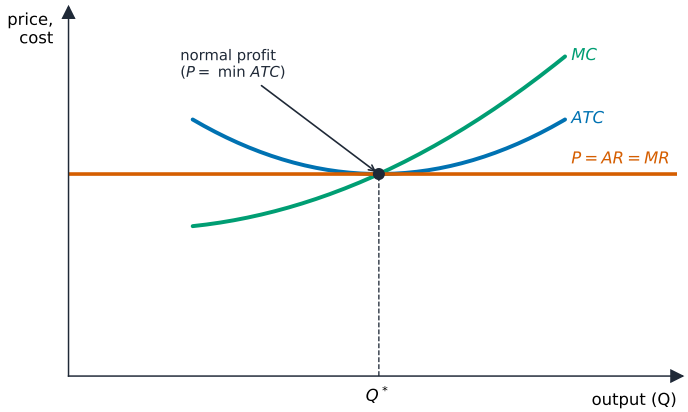
2 Two kinds of profit

- **Accounting profit** = revenue − the money costs you pay.
- **Economic profit** 经济利润 = revenue − money costs − the opportunity costs of your own resources.

Worked example. A shop earns \$200,000 and pays \$120,000 in costs, so accounting profit is \$80,000. But the owner gave up a \$70,000 salary elsewhere, so economic profit is 80,000 − 70,000 = \$10,000.

3 Perfect competition

Perfect competition 完全竞争 has many small firms selling an identical product, with free entry. Each firm is a **price taker** – too small to change the market price.



4 The long run

In perfect competition, profits attract new firms (entry) until economic profit falls to **zero** – firms just cover all their costs, including opportunity costs.

Watch out: zero **economic** profit is not the disaster it sounds – it means the owner is earning exactly what their resources could earn elsewhere. It is a perfectly acceptable, "normal" outcome.

Practice

Try these in order. The methods are all above.

2.1 State the rule for the profit-maximizing quantity. [1]

2.2 State the difference between accounting profit and economic profit. [2]

2.3 A business earns $150,000 and pays $90,000 in costs. Find the accounting profit. [2]

2.4 The owner gave up a $50,000 salary. Find the economic profit. [2]

2.5 Explain why firms in perfect competition earn zero economic profit in the long run. [2]

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.

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1. Anderson Company is a typical firm that manufactures Good G in a constant-cost, perfectly competitive market. Anderson Company is currently earning positive economic profit.

(a) What must be true about the relationship between accounting profit and economic profit if Anderson Company currently incurs both explicit and implicit costs in production?

(b) Draw correctly labeled side-by-side graphs for the market and Anderson Company 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 Anderson Company, labeled P_F and Q_F, respectively
(iii) The area representing Anderson Company's positive economic profit, shaded completely

(c) On your graphs in part (b), show what will happen to each of the following if the market for Good G adjusts to long-run equilibrium.

(i) The market equilibrium price and quantity, labeled P_2 and Q_2, respectively
(ii) Anderson Company's profit-maximizing price and quantity, labeled P* and Q*, respectively

(d) Assume the production of Good G creates benefits for third parties.

(i) Given this situation, will the market equilibrium quantity be greater than, less than, or equal to the allocatively efficient quantity? Explain.
(ii) The government takes an action that corrects the externality in the market for Good G. As a result of the government's action, does total economic surplus increase, decrease, or stay 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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4 Market power and monopoly – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
market power	市场势力			
monopoly	垄断			
barriers to entry	进入壁垒			
deadweight loss	无谓损失			

Recall

Not every market has lots of small firms:

- Some products come from just one company, or a few big ones.
- A single seller can charge a higher price than a competitive market.
- Firms with power behave differently from price-takers.

This sheet lines up monopoly. Each idea has a worked example.

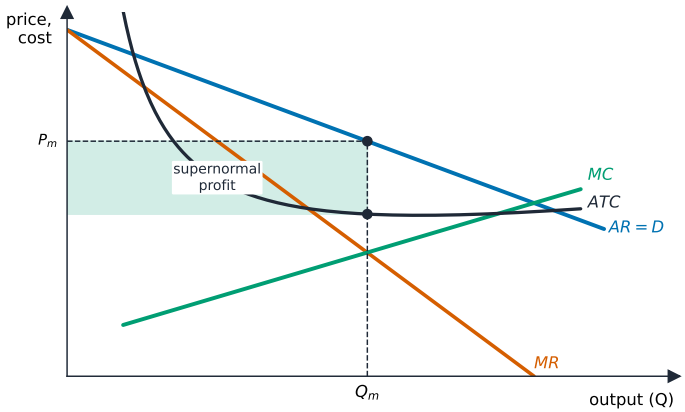
New ideas

1 Market power

Most real markets are **imperfectly competitive** – firms have some **market power** 市场势力 (the ability to set the price, not just take it).

2 Monopoly

A **monopoly** 垄断 is a single seller with no close substitutes, protected by **barriers to entry** 进入壁垒 (patents, control of a resource, or huge economies of scale).



3 Less output, higher price

Compared with perfect competition, a monopoly produces **less** and charges **more**, and it can keep earning profit because entry is blocked.

4 Deadweight loss

Because it under-produces, a monopoly creates **deadweight loss** 无谓损失 – mutually beneficial trades that no longer happen. This is why monopolies are seen as inefficient.

Watch out: a monopoly cannot charge **any** price it likes – it is still limited by the demand curve. Charge too much and buyers walk away; it picks the price that maximizes profit, not the highest possible price.

Practice

Try these in order. The methods are all above.

2.1 State what "market power" means. [1]

2.2 State what a monopoly is and give one barrier to entry that protects it. [2]

2.3 Compared with perfect competition, state what a monopoly does to output and price. [2]

2.4 Explain what deadweight loss is. [2]

2.5 Explain why a monopoly still cannot charge an unlimited price. [2]

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.

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4 Oligopoly and game theory – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	**中文**	**Write it 3 times** (English)		
oligopoly	寡头垄断			
game theory	博弈论			
dominant strategy	优势策略			
Nash equilibrium	纳什均衡			

Recall

In Part A you met monopoly. Now markets with just a **few** big firms:

- Cars, phones, and airlines are sold by a handful of large companies.
- Each firm watches what its rivals do before deciding.

Each idea has a worked example before the Practice.

New ideas

1 Oligopoly

An **oligopoly** 寡头垄断 is a market with a **few** large firms that are **interdependent** – each firm's best move depends on what its rivals do.

2 Game theory

Because firms react to each other, economists use **game theory** 博弈论. A **payoff matrix** shows each firm's profit for every combination of choices.

■ 3 Dominant strategy and Nash equilibrium

- A **dominant strategy** 优势策略 is a firm's best choice **whatever** the rival does.
- A **Nash equilibrium** 纳什均衡 is an outcome where no firm can do better by changing its choice alone.

Worked example. Two firms each pick High or Low price. Profits (A, B): both High $\to (10, 10)$; A Low, B High $\to (14, 4)$; both Low $\to (6, 6)$. For A, Low beats High whatever B does, so **Low is dominant** – and by symmetry for B. The Nash equilibrium is both Low $(6, 6)$, worse for both than cooperating.

■ 4 Why cooperation is hard

Firms would both gain by cooperating (acting like a monopoly), but each has an incentive to cheat – so they often end up at the worse outcome. This is the prisoners' dilemma.

Watch out: the Nash equilibrium can be **worse for everyone** than cooperating – yet each firm still ends up there, because each is following its own best move given the other's.

Practice

Try these in order. The methods are all above.

2.1 State what an oligopoly is. [2]

2.2 State what a "dominant strategy" is. [2]

2.3 State what a Nash equilibrium is. [2]

2.4 For the example (both Low = $(6, 6)$, cooperating = $(10, 10)$), state which outcome the firms reach and why it is worse for them. [2]

2.5 Explain why firms in an oligopoly find it hard to cooperate. [2]

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^*
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(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. Camden's Cakery is one of many dessert cafés serving a local community. Each café produces a slightly differentiated product, there are no barriers to entry or exit, and the firm is in long-run equilibrium.

(a) Draw a correctly labeled graph showing Camden's demand curve, marginal revenue curve, marginal cost curve, and long-run average total cost curve. Label Camden's profit-maximizing output Q_m and its price P_m.

(b) On your graph in part (a), label the output at which total revenue is maximized Q_R.

(c) Do firms in this market experience economies of scale, diseconomies of scale, or neither in long-run equilibrium? Explain.

STOP

END OF EXAM

2. Breadbasket and Quicklunch are the only two sandwich shops serving a small town. Each shop can choose to set a high price or a low price for sandwiches. The payoff matrix below shows the daily profits for each combination of prices that the two shops could choose. The first entry shows Breadbasket's profits, and the second entry shows Quicklunch's profits. Assuming that both shops know the information shown in the matrix, answer the following.

Quicklunch

Breadbasket		High Price	Low Price
	High Price	\$105, \$110	\$40, \$130
	Low Price	\$120, \$80	\$75, \$70

(a) Does each shop have a dominant strategy to set a high price, a dominant strategy to set a low price, or does it have no dominant strategy?

(i) Breadbasket

(ii) Quicklunch

(b) If the two shops do not cooperate on setting prices, what will be the profit for each shop?

(i) Breadbasket

(ii) Quicklunch

(c) The town government is concerned that food prices are too high. It decides to give a daily subsidy of \$20 to any shop that chooses to set a low price for its food items. Redraw the payoff matrix under the government subsidy system.

Using your redrawn payoff matrix, answer each of the following.

(i) Would Quicklunch choose to set a high price or a low price? Explain using specific values from your redrawn matrix.

(ii) Would the profits for Breadbasket increase, decrease, or stay the same? Explain with a comparison to your answer in part (b)(i). Use the specific values.

5 The labour market – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
factor market	要素市场			
derived demand	派生需求			
marginal revenue product	边际收益产品			

Recall

Firms don't only sell goods – they also buy workers and resources:

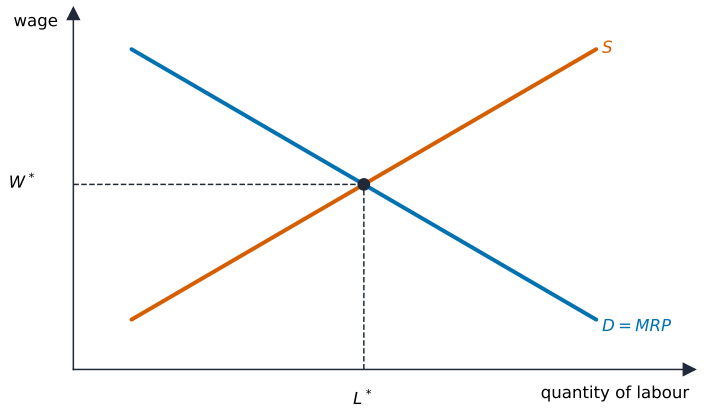
- Businesses hire workers and pay wages.
- A worker is worth hiring if they bring in more than they cost.
- Demand for workers depends on demand for what they make.

This sheet lines up the labour market. Each idea has a worked example.

New ideas

1 Factor markets

A **factor market** 要素市场 is where firms buy the factors of production – labour, land, capital. The roles reverse: firms **demand** and households **supply**.



2 Derived demand

Demand for workers is a **derived demand** 派生需求 – firms want workers not for themselves but for the output they produce. So more demand for a product means more demand for its workers.

3 Marginal revenue product

A worker's value to the firm is the **marginal revenue product** 边际收益产品 (MRP): the extra revenue from hiring one more worker, MRP = marginal product × price.

Worked example. A worker makes 8 units, each sold for \$5, so $MRP = 8 \times \$5 = \$40$.

4 The hiring rule

A firm hires workers up to where the MRP equals the **wage**. If a worker's MRP is above the wage, hire them; if below, do not.

Watch out: as a firm hires more workers, each new worker usually adds **less** output (diminishing returns), so MRP falls. The firm keeps hiring only until MRP drops to the wage.

Practice

Try these in order. The methods are all above.

2.1 State who demands and who supplies in a labour market. [2]

2.2 Explain what "derived demand" means for workers. [2]

2.3 A worker makes 6 units, each sold for \$4. Find the marginal revenue product. [2]

2.4 The wage is \$30. State whether the firm should hire the worker in 2.3, and why. [2]

2.5 State the rule a firm uses to decide how many workers to hire. [1]

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.

5 Monopsony – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
monopsony	买方垄断			
marginal factor cost	边际要素成本			

Recall

In Part A you met the competitive labour market. Now what happens with only **one** big employer:

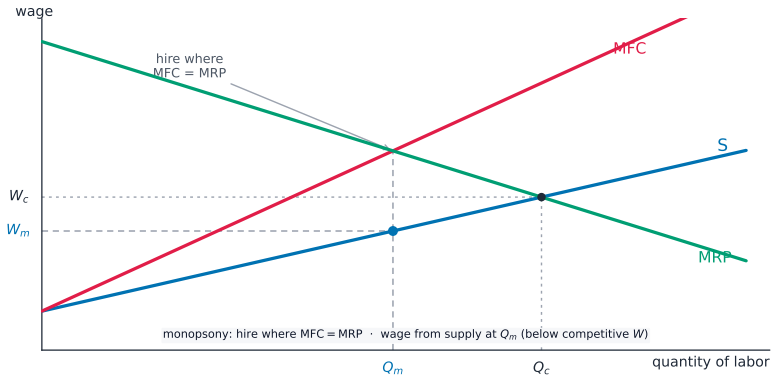
- In some towns, a single large company hires most of the workers.
- With little competition for workers, that firm has power over wages.

Each idea has a worked example before the Practice.

New ideas

1 Monopsony

A **monopsony** 买方垄断 is a market with a **single buyer** of a factor – for example, the only big employer in a town.



2 Raising the wage for everyone

Because it is the whole market, to hire more workers the monopsonist must raise the wage **for everyone** – not just the new hire.

3 Marginal factor cost

So the cost of one more worker (the **marginal factor cost** 边际要素成本, MFC) is **above** the wage. It is the mirror image of a monopoly, where marginal revenue is below the price.

4 The result

A monopsony hires **fewer** workers at a **lower** wage than a competitive market would – it uses its power over wages to hold both down.

Watch out: a monopsony pays **less** than a competitive market, not more. Its single-buyer power lets it push the wage below what many firms competing for the same workers would offer.

Practice

Try these in order. The methods are all above.

2.1 State what a monopsony is. [2]

2.2 Explain why a monopsonist must raise the wage for everyone to hire one more worker. [2]

2.3 State whether the marginal factor cost is above or below the wage for a monopsonist. [1]

2.4 Compared with a competitive market, state what a monopsony does to the wage and the number of workers. [2]

2.5 State which everyday situation could create a monopsony. [1]

2. The table below shows the output a firm produces using different amounts of capital (K) and labor (L). The markets for capital and labor are perfectly competitive. The rental rate of capital is $75 per unit, and the wage rate is $200 per unit. In the short run, capital is fixed and labor is variable.

Labor	Output with K=1	Output with K=2
0	0	0
1	10	20
2	25	50
3	38	75

(a) If the firm uses one unit of capital and one unit of labor, will it be operating with constant, increasing, or decreasing returns to scale? Explain using numbers from the table.

(b) Assume now that the firm currently has two units of capital and is using three units of labor.

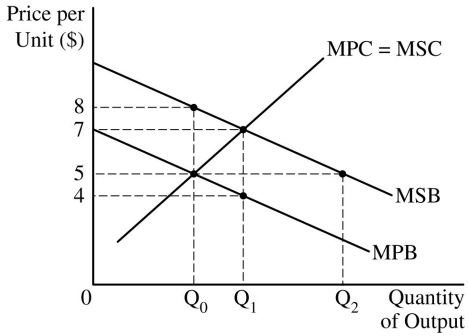
(i) Calculate the marginal product for the third unit of labor. Show your work.

(ii) Did the firm experience diminishing marginal returns with the addition of the third unit of labor? Explain using numbers from the table.

(iii) Calculate the firm's average total cost for its current level of production. Show your work.

(iv) If the firm's output is sold in a competitive market, what is the lowest output price at which the third unit of labor would be hired?

2. Bueno is a firm that produces and sells guava, a type of fruit. The market for guava is perfectly competitive. The marginal private benefit (MPB), marginal private cost (MPC), marginal social benefit (MSB), and marginal social cost (MSC) curves are illustrated in the graph provided.



(a) Identify the kind of market failure represented by this graph.

(b) Using numbers from the graph, identify the marginal external benefit.

(c) Assume the guava market is in short-run equilibrium and Bueno hires workers in a perfectly competitive labor market at a wage of $20 per hour. The marginal product of the last worker hired was 6 units of guava per hour.

(i) Calculate the change in Bueno's profit per hour from the last worker hired. Show your work.
(ii) Suppose that the government decides to provide a per-unit subsidy to consumers who buy guava. How would the per-unit subsidy affect Bueno's marginal revenue product curve? Explain.

(d) Instead of hiring workers in a perfectly competitive labor market, assume Bueno hires workers in a monopsony labor market. Will the number of workers hired increase, decrease, or stay 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.

6 Externalities – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
externality	外部性			
negative externality	负外部性			
positive externality	正外部性			
Pigovian tax	庇古税			

Recall

Markets usually work well, but not always:

- A factory's pollution harms people who had nothing to do with it.
- A vaccination protects not just you but everyone around you.
- Sometimes the government steps in to fix a problem.

This sheet lines up externalities. Each idea has a worked example.

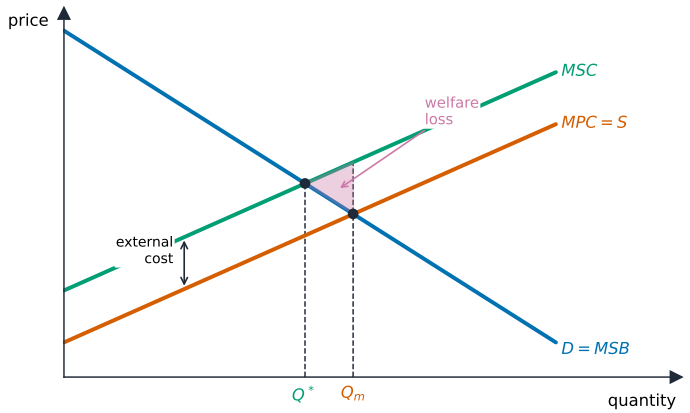
New ideas

1 Externalities

An **externality** 外部性 is a cost or benefit that falls on a **third party** not involved in a transaction – so buyers and sellers ignore it.

2 Negative externalities

A **negative externality** 负外部性 (like pollution) means the true cost to society is **higher** than the private cost, so the market **over-produces**.



3 Positive externalities

A **positive externality** 正外部性 (like vaccination or education) means society benefits **more** than the private buyer, so the market **under-produces**.

4 Fixing them

- A **Pigovian tax** 庇古税 on a negative externality makes producers pay for the harm, cutting output to the right level.
- A **subsidy** on a positive externality encourages more of it.

Worked example. A factory's private cost is \$8 per unit, but each unit also causes \$3 of pollution. A tax of \$3 per unit raises the firm's cost to the true social cost of \$11, so it produces the efficient amount.

Watch out: with a negative externality the market makes **too much** (it ignores the harm); with a positive externality it makes **too little** (it ignores the extra benefit). The fixes go in opposite directions.

Practice

Try these in order. The methods are all above.

2.1 State what an externality is. [2]

2.2 Give one example of a negative and one of a positive externality. [2]

2.3 State whether the market over- or under-produces a good with a negative externality. [1]

2.4 A factory's private cost is \$10 per unit and it causes \$4 of pollution per unit. State the Pigovian tax that would correct this. [2]

2.5 State the tool a government uses to encourage a good with a positive externality. [1]

2. Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.

   (a) Draw a correctly labeled graph of the copper 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 efficient quantity, labeled Q_S

   (b) Suppose the demand for copper decreases. On your graph in part (a), show the deadweight loss at the new market equilibrium, shaded completely.

   (c) Suppose the government is considering levying a tax on copper.

   (i) What per-unit tax level would achieve the socially optimal quantity?
   (ii) Explain why a lump-sum tax on producers will not achieve the socially optimal quantity in the short run.

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.

6 Public goods and inequality – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
public good	公共物品			
free-ride	搭便车			
Lorenz curve	洛伦兹曲线			
Gini coefficient	基尼系数			

Recall

In Part A you met externalities. Now two more reasons markets need help:

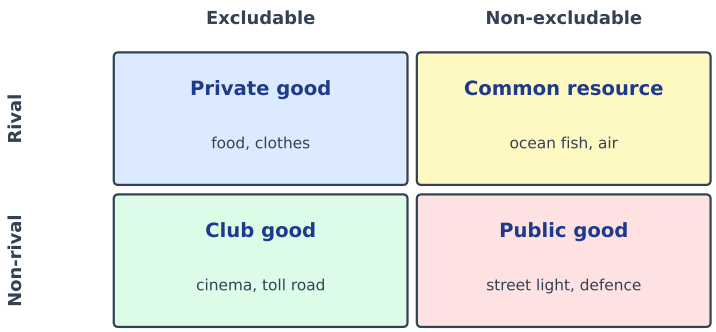
- Some things (like street lighting) would never be provided by a shop.
- Market incomes can be very unequal.

Each idea has a worked example before the Practice.

New ideas

1 Rival and excludable

Goods differ in two ways: is one person's use at another's expense (**rival**), and can non-payers be kept out (**excludable**)?

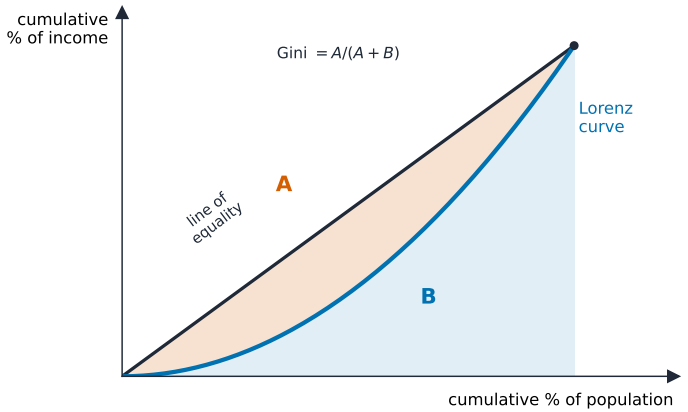


2 Public goods

A **public good** 公共物品 is **non-rival and non-excludable** (national defence, street lighting). Since non-payers cannot be excluded, people **free-ride** 搭便车, so markets **under-provide** it – and government usually supplies it.

3 Measuring inequality

Market incomes can be very unequal. The **Lorenz curve** 洛伦兹曲线 plots the share of income against the share of population; the further it bows from the diagonal, the more unequal.



■ 4 The Gini coefficient

The **Gini coefficient** 基尼系数 summarizes this in one number: 0 means perfect equality, 1 means perfect inequality.

Watch out: a **public** good is not just any good the government provides – it must be **non-rival and non-excludable**. A public hospital's beds are rival (one patient's use blocks another's), so healthcare is not a pure public good.

Practice

Try these in order. The methods are all above.

2.1 State the two features that define a public good. [2]

2.2 Explain why markets under-provide public goods (use the idea of free-riding). [2]

2.3 Give one example of a public good. [1]

2.4 State what a Gini coefficient of 0 and of 1 each mean. [2]

2.5 State what a Lorenz curve that bows far from the diagonal tells you. [1]

2. Copper is produced in a perfectly competitive market with an upward-sloping supply curve and a downward-sloping demand curve. Assume the production of copper results in liquid waste, which seeps into local rivers. The contaminated river water causes human illnesses and crop failures downstream. The marginal external cost from producing copper is constant across all quantities of copper produced.

   (a) Draw a correctly labeled graph of the copper 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
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   (b) Suppose the demand for copper decreases. On your graph in part (a), show the deadweight loss at the new market equilibrium, shaded completely.

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