MICROECONOMICS Principles

Grades 9–12 · College | 8 pages

Scarcity and opportunity cost · supply and demand · equilibrium · elasticity · surplus, price controls and taxes · consumer choice · costs · perfect competition · monopoly · monopolistic competition and oligopoly · game theory · factor markets · market failure · graphs

1 Economic thinking | 2 Trade & systems | 3 Demand & supply | 4 Equilibrium | 5 Elasticity | 6 Surplus & controls | 7 Consumer choice | 8 Costs | 9 Perfect competition | 10 Monopoly | 11 Imperfect competition | 12 Factor markets | 13 Market failure | 14 Practice | 15 Key formulas | 16 Common errors

1 ECONOMIC THINKING

Core ideas

Scarcity — wants outrun the resources to meet them, so every choice gives something up

Opportunity cost — the **next-best** thing given up (not every option, just the best one)

Marginal — one more (or one less); decide by comparing **marginal benefit** with **marginal cost**

Incentive — a reward or penalty that changes behavior

Sunk cost — already spent and unrecoverable; ignore it in the next decision

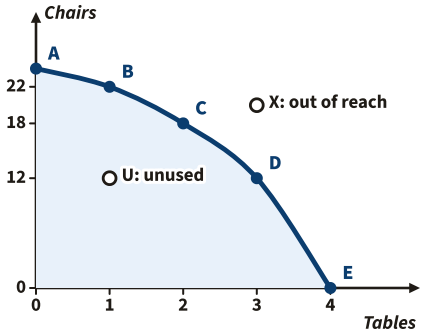
MEMORY TRICK

Next best, not all the rest

Opportunity cost is the **single best** option you passed up. Saturday spent mowing for $40 costs the $40 job only if mowing was the next-best use of the day.

Factors of production

Factor	Examples	Income
Land	soil, water, timber, oil	rent
Labor	human effort and skill	wages
Capital	tools, machines, buildings	interest
Entrepreneurship	organizing and risk-taking	profit



A woodshop's week

Point	Tables	Chairs	Cost of next table
A	0	24	2 chairs
B	1	22	4 chairs
C	2	18	6 chairs
D	3	12	12 chairs
E	4	0	—

Bowed out: each extra table costs more chairs (**increasing opportunity cost**). On the curve = **efficient**; inside = idle resources; growth shifts it out.

Two kinds of claims

Positive statement — what **is**; can be tested ("a tax raises the price buyers pay")

Normative statement — what **ought** to be; a value judgment ("the tax should be lower")

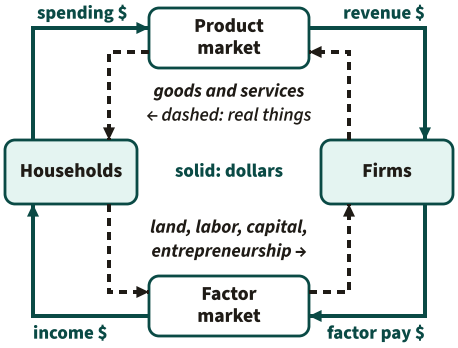
"The thoughts of the diligent tend only to plenteousness; but of every one that is hasty only to want." (Proverbs 21:5, KJV)

2 TRADE, SYSTEMS & THE CIRCULAR FLOW

Comparative advantage

Per day	Pies	Loaves	Cost of 1 pie
Ana	6	12	2 loaves
Ben	2	8	4 loaves

Ana has the **absolute** advantage in both. Ana gives up less for a pie (2 loaves), so she bakes pies; Ben gives up less for a loaf (¼ pie vs ½), so he bakes bread. Both gain at any price between 2 and 4 loaves a pie.



Gains from trade

Pies, loaves	Ana	Ben	Total
Each splits the day	3, 6	1, 4	4, 10
Specialize (Ana mostly pies)	5, 2	0, 8	**5, 10**
Trade 1½ pies for 4 loaves	**3½, 6**	**1½, 4**	5, 10

Same day's work, one more pie. Each ends with half a pie more than working alone (a price of 2⅔ loaves, inside the 2-to-4 range).

Economic systems

System	Who decides what, how and for whom
Traditional	custom and the way it has always been done
Command	a central planner sets output and prices
Market	buyers and sellers, through prices, private property and profit
Mixed	mostly markets plus government rules, taxes and services (the U.S.)

Trade terms

Specialization — each does what he does at the lowest opportunity cost

Absolute advantage — more output from the same resources

Comparative advantage — a **lower opportunity cost**; the basis of trade (David Ricardo, 1817)

Terms of trade — the price both accept; it must lie between the two opportunity costs

MEMORY TRICK

Lower cost, not more skill

Trade follows **comparative** advantage: who gives up less, not who is better at everything.

3 DEMAND & SUPPLY

A honey stand's market each week

Price	Qd (jars)	Qs (jars)	Result
$3	90	30	shortage 60
$4	80	50	shortage 30
$5	70	70	**equilibrium**
$6	60	90	surplus 30
$7	50	110	surplus 60

Qd = 120 − 10P and Qs = 20P − 30.

What shifts the curves

Demand shifts with	Supply shifts with
Tastes	**R**esource (input) prices
Related goods' prices	**O**ther goods the seller could make
Income	**T**echnology
Buyers (number)	**T**axes and subsidies
Expectations	**E**xpectations
	Number of sellers

"He that withholdeth corn, the people shall curse him: but blessing shall be upon the head of him that selleth it." (Proverbs 11:26, KJV)

Market demand = the sum of buyers

Price	Ann	Bo	Cal	Market
$4	6	4	3	13
$5	4	3	2	9
$6	3	1	1	5
$7	1	0	0	1

Add the **quantities** at each price (sideways on a graph), never the prices.

MEMORY TRICK

TRIBE and ROTTEN (Traditional)

Demand: **T**astes, **R**elated prices, **I**ncome, **B**uyers, **E**xpectations. Supply: **R**esources, **O**ther goods, **T**echnology, **T**axes, **E**xpectations, **N**umber of sellers.

Slide or shift?

- A change in the good's **own price** slides along the curve: a change in **quantity demanded** (or supplied).
- Anything else **shifts** the whole curve: a change in **demand** (or supply). Right = increase; left = decrease.

Definitions

Law of demand — price up → quantity demanded down (substitution effect, income effect)

Law of supply — price up → quantity supplied up (more is worth producing)

Demand — the whole schedule or curve: how much buyers will buy at **each** price

Normal good — demand rises with income; **inferior good**: falls (bus rides, store brands)

Substitutes — one's price up → the other's demand up (coffee, tea)

Complements — one's price up → the other's demand down (hot dogs, buns)

Ceteris paribus — "other things equal": each curve holds everything but price fixed

4 MARKET EQUILIBRIUM & SHIFTS

Solve for equilibrium WORKED

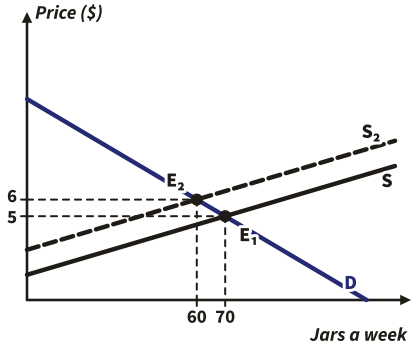
Set Qd = Qs: 120 − 10P = 20P − 30

150 = 30P, so **P* = $5** *price*

Q* = 120 − 10(5) = **70 jars** *quantity*

Demand rises 30 at every price: 150 − 10P = 20P − 30 → **$6, 90 jars**

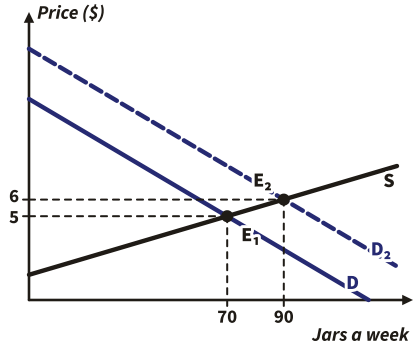
new E_2



A late frost adds $1.50 a jar to every beekeeper's cost: S_2 is P = 3 + 0.05Q, so 12 − 0.1Q = 3 + 0.05Q gives 60 jars at $6. Price up, quantity down.

MEMORY TRICK **Marshall's scissors**

Asking whether supply or demand sets the price is like asking which blade of the scissors cuts the paper (Alfred Marshall). It takes both.



Demand rises by 30 jars at every price: E_1 ($5, 70) moves to E_2 ($6, 90).

Eight shifts at a glance

Change	Price	Quantity
Demand ↑	↑	↑
Demand ↓	↓	↓
Supply ↑	↓	↑
Supply ↓	↑	↓
Demand ↑, supply ↑	?	↑
Demand ↓, supply ↓	?	↓
Demand ↑, supply ↓	↑	?
Demand ↓, supply ↑	↓	?

? = depends on which shift is larger. Both at once (demand +30 and the frost): 15 − 0.1Q = 3 + 0.05Q → **$7, 80 jars**.

How a market clears

Equilibrium — Qd = Qs; no pressure to change

Shortage — price below equilibrium: Qd > Qs; buyers bid the price up

Surplus — price above: Qs > Qd; sellers cut the price

Prices as signals — a rising price tells buyers to save and sellers to bring more, with no one in charge ("I, Pencil"; Hayek)

Shift practice

Event in the honey market	Curve	P	Q
A news story says honey soothes coughs	D right	↑	↑
Sugar (a substitute) gets cheaper	D left	↓	↓
A new extractor doubles output per hour	S right	↓	↑
Mites kill a third of the hives	S left	↑	↓
Buyers expect a price jump next month	D right now	↑	↑
Honey's own price falls	no shift: slide along D	—	Qd ↑

5 ELASTICITY

Price elasticity of demand (midpoint)

Report $|E_d|$; the sign is negative by the law of demand.

$$E_d = \frac{\%\Delta Q}{\%\Delta P}$$

$$\%\Delta = \frac{\text{new} - \text{old}}{\text{average of the two}}$$

Categories and the total-revenue test

$\lvert E_d \rvert$	Name	Price ↑ means TR
> 1	elastic	↓
= 1	unit elastic	no change
< 1	inelastic	↑
0	perfectly inelastic (vertical)	↑ by the full %
∞	perfectly elastic (horizontal)	falls to 0

King's law

A short harvest raises the price of grain by more than the shortfall, so farm income can rise (Gregory King, England, about 1696). Food demand is inelastic.

Kettle-corn cart WORKED

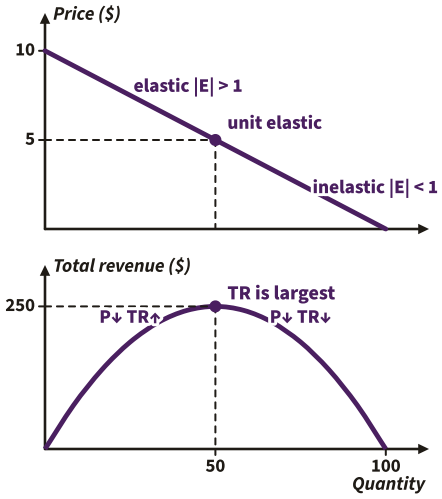
Price \$4 → \$5: %ΔP = 1 ÷ 4.5 = 22.2%

Bags 100 → 70: %ΔQ = −30 ÷ 85 = −35.3%

E_d = −35.3 ÷ 22.2 = **-1.59**: elastic $|E| > 1$

Revenue \$400 → \$350: the price rise **lost** money

TR test



Determinants and other elasticities

More elastic when many substitutes, a luxury, a big share of the budget, a narrow market (one brand), more time to adjust

Income elasticity %ΔQ ÷ %Δincome. Income 40k → 50k: meals out 20 → 26 = **1.17** (normal); store brand 30 → 24 = **-1** (inferior)

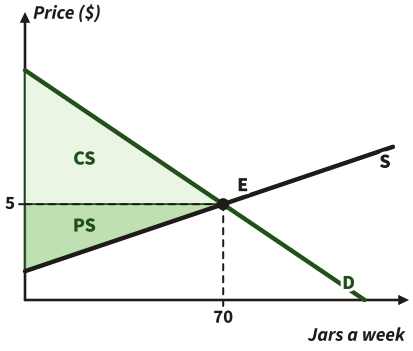
Cross-price $\%\Delta Q_A \div \%\Delta P_B$. Coffee \$2 → \$3, tea 50 → 70 cups: **+0.83** (substitutes); negative = complements

Supply elasticity honey \$4 → \$6: Qs 50 → 90 = **1.43** (elastic); Qd 80 → 60 = **-0.71** (inelastic)

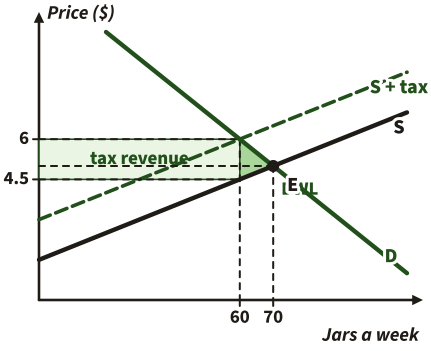
MEMORY TRICK **Inelastic: in step**

Inelastic: price and revenue move **in** step (both up or both down). **E**lastic: price and revenue **e**ach go the other way.

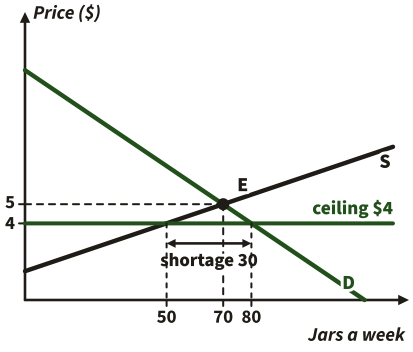
6 SURPLUS, PRICE CONTROLS & TAXES



Consumer and producer surplus



A \$1.50 tax on sellers



A price ceiling below equilibrium

Worked numbers

Honey market	Value
Consumer surplus ½ × (12 − 5) × 70	\$245
Producer surplus ½ × (5 − 1.50) × 70	\$122.50
Total surplus	**\$367.50**
Ceiling \$4: Qd 80, Qs 50	shortage 30
Floor \$6: Qd 60, Qs 90	surplus 30

MEMORY TRICK

Ceiling below, floor above

A ceiling only bites **below** the market price, a floor only **above** it, the opposite of a room, which is why the names trip students up.

Who pays a tax

Tax of \$1.50 a jar	Value
Jars sold	70 → 60
Buyers pay	\$5 → \$6 (bear \$1)
Sellers keep	\$5 → \$4.50 (bear \$0.50)
Tax revenue 1.50 × 60	\$90
Deadweight loss ½ × 1.50 × 10	\$7.50

The **less elastic** side bears more of the tax, whoever writes the check.

Terms

Consumer surplus what buyers would pay minus what they pay

Producer surplus price received minus the least the seller would take

Price ceiling a legal maximum; binding only **below** equilibrium → shortage, lines, black markets, lower quality

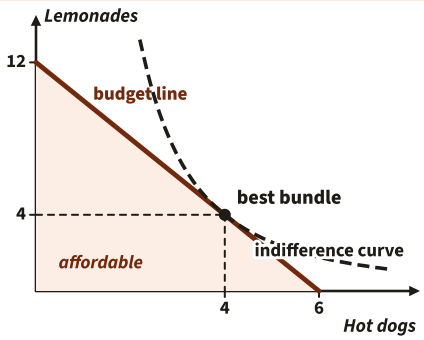
Price floor a legal minimum; binding only **above** equilibrium → surplus (unsold goods or unemployed workers)

Deadweight loss surplus no one gets because trades that were worth making stop

7 CONSUMER CHOICE

Spending $12 at the ballpark

Unit	Hot dog MU	MU ÷ $2	Lemonade MU	MU ÷ $1
1	20	10	9	9
2	16	8	8	8
3	12	6	6	6
4	8	4	4	4
5	4	2	3	3
6			2	2
7			1	1



Same budget: $12, hot dogs $2, lemonade $1

Utility-maximizing rule WORKED

Buy the next item with the highest MU per dollar

With $12: **4 hot dogs, 4 lemonades** = 4 × 2 + 4 × 1 = 12 *all spent*

Last items: 8 ÷ 2 = **4** and 4 ÷ 1 = **4** *equal*

Total utility = 56 + 27 = **83 utils**, the most any affordable bundle gives *checked*

MEMORY TRICK **Last dollar rule**

Spend so the **last dollar** on every good brings the same extra satisfaction. If one good gives more per dollar, move money to it.

The rule

with all income spent

$$MU_A \div P_A = MU_B \div P_B$$

Terms

Diminishing marginal utility each extra unit adds less than the one before

Budget line every bundle that spends the whole income

Substitution effect a cheaper good is bought in place of others

Income effect a lower price leaves more buying power

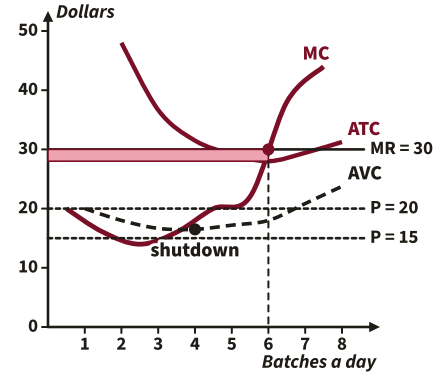
Diamond-water paradox water is vital but plentiful, so its **marginal** utility and price are low

8 PRODUCTION & COSTS

Hot dog stand: daily costs (Q = batches of 10)

Q	TFC	TVC	TC	AFC	AVC	ATC	MC
0	60	0	60	—	—	—	—
1	60	20	80	60	20	80	20
2	60	36	96	30	18	48	16
3	60	50	110	20	16.67	36.67	14
4	60	66	126	15	16.5	31.5	16
5	60	86	146	12	17.2	29.2	20
6	60	108	168	10	18	28	22
7	60	146	206	8.57	20.86	29.43	38
8	60	190	250	7.5	23.75	31.25	44

Fixed: cart rental and permit, $60 a day. AFC = TFC ÷ Q, AVC = TVC ÷ Q, ATC = TC ÷ Q = AFC + AVC, MC = ΔTC ÷ ΔQ.



MEMORY TRICK

Fixed costs don't decide

The $60 cart rent is owed whether the stand sells 0 or 80 hot dogs, so it never changes **how many** to make. Only marginal cost and marginal revenue do.

Short run and long run

Short run at least one input is fixed (the cart)

Long run every input can change; firms can enter or leave

Diminishing returns adding workers to a fixed cart: each extra worker adds less output, so **MC rises**

MC and averages MC cuts AVC and ATC at their **lowest** points (a low score pulls an average down)

Accounting vs economic profit

Hot dog stand, one year	$
Revenue	64,000
− Explicit costs (paid out)	41,000
= **Accounting profit**	**23,000**
− Owner's forgone wage	26,000
− Forgone interest: 5% of $10,000	500
= **Economic profit**	**(3,500)**

Economic profit counts **implicit costs** too. Zero economic profit = **normal profit**: the owner earns what the next-best use would pay.

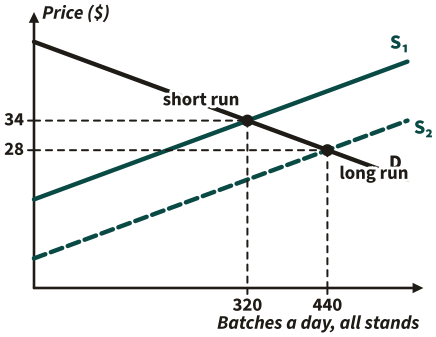
Long-run average cost

Economies of scale long-run ATC falls as the firm grows; **diseconomies**: it rises (too many layers)

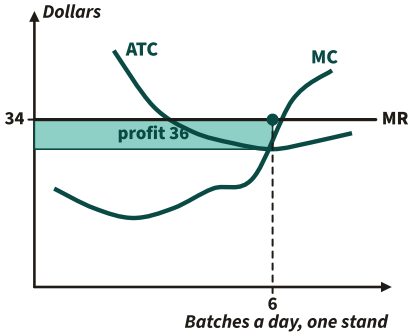
Minimum efficient scale smallest output at the lowest long-run ATC

9 PERFECT COMPETITION

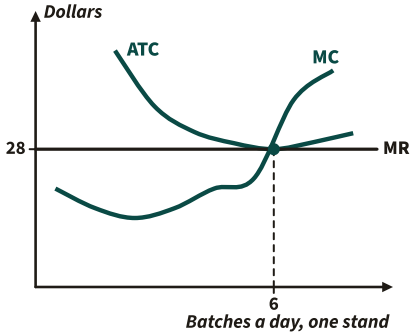
1 Market: entry shifts supply right



2 One stand at $34: profit



3 Long run at $28: zero profit



The model

Features many small sellers, identical products, free entry and exit, full information

Price taker one stand cannot change the market price: **P = MR = AR = demand** (horizontal)

Profit rule produce where **MR = MC** (the last unit adds as much revenue as cost)

Long run

- Profits draw new stands in; supply rises and the price falls.
- Losses push stands out; the price rises.
- Entry and exit stop at **P = minimum ATC**: zero economic profit.

The hot dog stand at four prices

Price	Best Q	TR	TC	Profit	Decision
$30	6	180	168	12	profit
$28	6	168	168	0	break even
$20	5	100	146	-46	stay open
$15	0	0	60	-60	shut down

At $30, MC of the 6th batch is 22 ≤ 30 but the 7th costs 38: make 6. At $20 the loss (46) beats closing (lose the full 60). At $15, price is under the lowest AVC ($16.50), so shut down and lose only the fixed $60.

MEMORY TRICK

Cover the variables or close the doors

In the short run, stay open while price covers **average variable cost**. Fixed costs are owed either way.

Short-run decisions

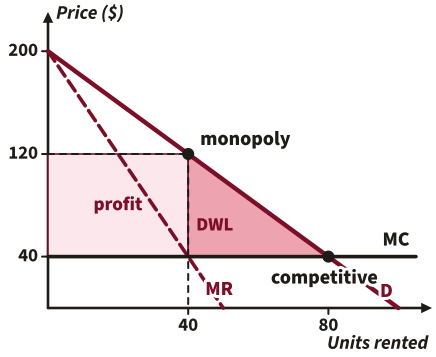
- **P > ATC**: economic profit.
- **AVC < P < ATC**: loss, but keep operating; revenue covers the variable costs and part of the fixed.
- **P < AVC**: shut down; the loss is just the fixed cost.
- The firm's **supply curve** is its MC curve above minimum AVC.

Why economists like it

Allocative efficiency **P = MC**: the last unit is worth exactly what it costs

Productive efficiency **P = minimum ATC**: made at the lowest cost

10 MONOPOLY



The only self-storage in town WORKED

Demand: P = 200 − 2Q; MC = $40 a unit

	monthly
MR = 200 − 4Q (twice as steep)	*linear rule*
MR = MC: 200 − 4Q = 40 → **Q = 40**	*units*
Price from demand: 200 − 2(40) = **$120**	
Profit over MC: (120 − 40) × 40 = **$3,200**	
Competition would rent 80 at $40; deadweight loss ½ × 80 × 40 = **$1,600**	*DWL*

Terms

Monopoly one seller, no close substitutes, blocked entry; a **price maker**

Barriers control of a key resource, patents and copyrights, licenses, huge start-up cost, network effects

MR < P to sell one more, the monopolist must lower the price on **every** unit

Natural monopoly one firm can serve the whole market at lowest cost (water mains, power lines); often regulated

Price discrimination different prices for the same good (student fares, matinees); needs market power, separated buyers, no resale. **Perfect** discrimination charges each buyer his top price: no deadweight loss, no consumer surplus

Compared with competition

- Higher price, lower output; P > MC (not allocatively efficient).
- Can keep economic profit in the long run because entry is blocked.
- Regulators may cap price at **P = MC** (efficient, but may lose money) or **P = ATC** (fair return).
- Antitrust history: Standard Oil broken up (1911); AT&T divided (1984).

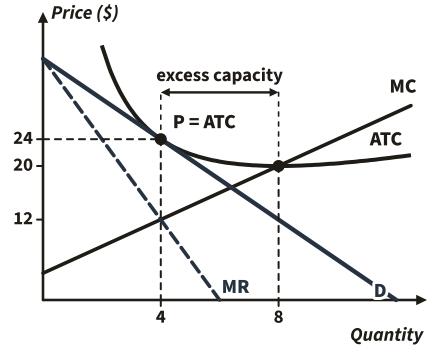
MEMORY TRICK **MR falls twice as fast**

For a straight-line demand curve, marginal revenue starts at the same price and falls **twice as steeply**, hitting zero at half the quantity.

11 MONOPOLISTIC COMPETITION & OLIGOPOLY

The four market structures

	Perfect competition	Monopolistic competition	Oligopoly	Monopoly
Sellers	very many	many	a few	one
Product	identical	differentiated	identical or differentiated	unique
Entry	free	easy	hard	blocked
Price power	none (taker)	some	much, interdependent	great (maker)
Long-run econ. profit	zero	zero	can persist	can persist
Efficient?	yes: P = MC = min ATC	no: excess capacity	usually not	no: P > MC
Example	wheat, eggs	hot dog stands, barbershops	airlines, soft drinks	the town's only storage lot



A hot dog stand with loyal customers, long run. Demand P = 36 − 3Q; TC = 64 + 4Q + Q^2. MR = MC at Q = 4, where P = ATC = $24: zero profit. Lowest ATC ($20) is at Q = 8, so 4 units of excess capacity, and P > MC ($12).

Two hot dog stands at one ballpark (daily profit: A, B)

Stand A ↓ / Stand B →	B: High price	B: Low price
A: High price	300, 300	100, 400
A: Low price	400, 100	**200, 200**

Read the game WORKED

If B goes High, A earns more Low (400 > 300); if B goes Low, A earns more Low (200 > 100)

So Low is A's **dominant strategy**; the same holds for B

Nash equilibrium: Low, Low (200 each); neither gains by switching alone

checked

Both would earn 300 at High, High: a **prisoner's dilemma**

Terms

Monopolistic competition — many sellers of **differentiated** goods (brand, location, service); advertising matters

Oligopoly — a few large firms that watch one another: **interdependence**

Collusion — agreeing to fix prices; illegal under the Sherman Act (1890); cartels break down because each member gains by cheating (railroad pools)

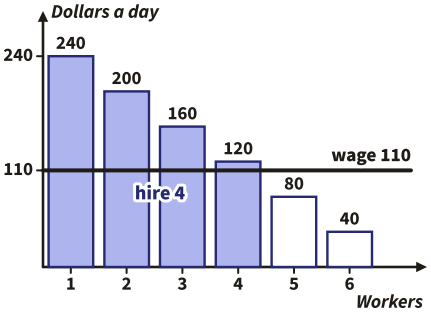
Game theory — choices when the payoff depends on what others choose

12 FACTOR MARKETS

A barbershop deciding how many to hire

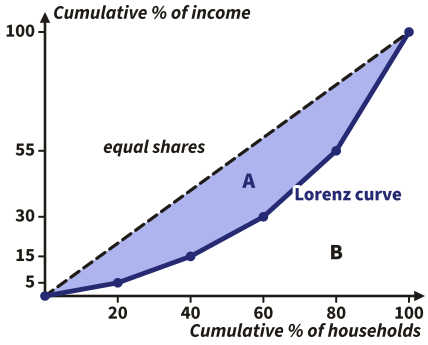
Barbers	Haircuts a day	MP	MRP = MP × $20
1	12	12	240
2	22	10	200
3	30	8	160
4	36	6	120
5	40	4	80
6	42	2	40

At a wage of $110 a day, the 4th barber brings in 120 > 110; the 5th only 80. **Hire 4.**



The hiring rule

- Hire until **MRP = MRC**. In a competitive labor market MRC is the wage.
- MRP = marginal product × price of the output (**MP × MR** in general).
- The MRP curve **is** the firm's demand curve for labor.



A made-up town: fifths of households earn 5, 10, 15, 25 and 45% of income, piling up to 5, 15, 30, 55, 100. Gini = A ÷ (A + B) = 0.38 (0 = all equal; 1 = one household has it all).

Labor markets

Derived demand — firms want workers because customers want haircuts

Labor demand shifts with — output price, productivity (training, tools), prices of other inputs

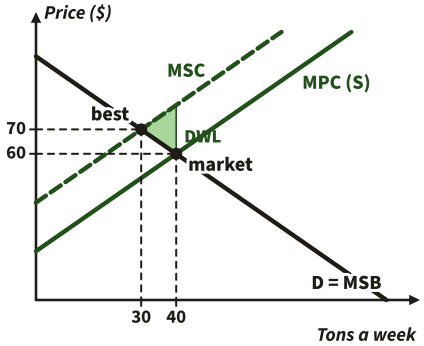
Human capital — skill and knowledge that raise productivity, and with it wages

Wage differences — skill, training, danger or unpleasant work (**compensating differentials**), location, scarcity of the skill

Monopsony — a single buyer of labor (the only mill in town): hires fewer at a lower wage

"Seest thou a man diligent in his business? he shall stand before kings; he shall not stand before mean men." (Proverbs 22:29, KJV)

13 MARKET FAILURE & GOVERNMENT



Dust from a feed mill WORKED

Demand P = 100 − Q; mill's cost MPC = 20 + Q

Dust costs neighbors $20 a ton: MSC = 40 + Q

external cost

Market: 100 − Q = 20 + Q → **40 tons at $60**

Best: 100 − Q = 40 + Q → **30 tons at $70**

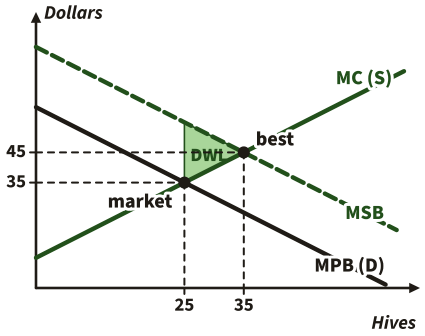
Deadweight loss ½ × 20 × 10 = **$100**; a $20-a-ton tax gets 30 tons

Pigou

Four kinds of goods

	Excludable	Not excludable
Rival	**private good**: a hot dog	**common resource**: ocean fish
Not rival	**club good**: toll road, streaming	**public good**: lighthouse, national defense

Public goods invite **free riders**. Ronald Coase (1974) found many British lighthouses were built privately and paid for by port fees.



Bees pollinate the neighbors' orchards: each hive is worth $20 to them. The market keeps 25 hives; the best number (MSB = MC) is 35. A $20-a-hive payment from the orchards, or a subsidy, closes the gap.

When rules backfire

Government failure — a fix that costs more than the problem: **rent seeking** (lobbying for favors), **unintended consequences**, the **knowledge problem** (no planner knows what prices tell everyone)

Weigh both — compare an imperfect market with an imperfect government, case by case

MEMORY TRICK **Outside the deal**
Buyer and seller weigh their own costs. An externality is a cost or benefit that lands on **someone who never agreed** to the trade.

Market failures

Externality — a cost or benefit that falls on someone **outside** the deal; negative (noise, dust) or positive (vaccination, a restored storefront)

Positive externality — MSB > MPB: the market makes **too little**; a subsidy can help

Tools — Pigouvian tax, regulation, tradable permits, clearer **property rights** (Coase: owners can bargain when costs are low)

Tragedy of the commons — no one owns it, so everyone overuses it (overfishing)

Asymmetric information — one side knows more: **adverse selection** (used-car lemons), **moral hazard** (insured people take more risk)

14 PRACTICE WITH ANSWERS

Ten problems across the sheet

#	Problem	Answer (every number recomputed by the build)
1	Qd = 90 − 5P and Qs = 10P − 30. Find the equilibrium.	90 − 5P = 10P − 30 → P = **$8**, Q = **50**
2	Price rises from $10 to $12; quantity demanded falls from 200 to 150. Elasticity (midpoint)?	−50/175 ÷ 2/11 = **-1.57**: elastic, so revenue falls (2,000 → 1,800)
3	At Q = 10, TC = $500 and TFC = $200. Find AFC, AVC and ATC.	AFC **$20**, AVC = 300 ÷ 10 = **$30**, ATC **$50**
4	A price taker faces P = $12. Where MC = 12, Q = 100 and ATC = $10. Profit? Long run?	(12 − 10) × 100 = **$200**; entry pushes P down to minimum ATC
5	Monopoly: demand P = 100 − Q, MC = $20. Find Q, P and the deadweight loss.	MR = 100 − 2Q = 20 → Q **40**, P **$60**; DWL ½ × 40 × 40 = **$800**
6	A worker adds 15 units a day; each sells for $8; the wage is $100. Hire?	MRP = 15 × 8 = **$120** > $100: **hire**
7	Income rises 10% and purchases of a good rise 15%. What kind of good?	15 ÷ 10 = **1.5**: normal (income-elastic, a luxury)
8	Demand P = 20 − Q, supply P = 2 + Q, and a $2 tax on sellers. Buyers' price, sellers' price, revenue, DWL?	Q 9 → **8**; buyers **$12**, sellers **$10**; revenue **$16**; DWL **$1**
9	Two players: Low/Low pays (5, 5), High/High (8, 8), and either player cutting alone gets 10 while the other gets 2. Nash equilibrium?	Low is dominant for both → **Low, Low** (a prisoner's dilemma)
10	A country can make 10 cars or 40 tons of wheat; its neighbor 5 cars or 30 tons. Who exports cars?	Car cost: **4 t** vs **6 t** of wheat → the **first country** exports cars

MEMORY TRICK **Show the setup**
Write the rule first (Qd = Qs, MR = MC, MRP = wage), then the numbers. Most lost points are a right answer to the wrong rule.

Before you check the answer
- Did a curve **shift** or did you **slide** along it?
- Is the price above or below equilibrium?
- Marginal or average? Total or per unit?

"Prove all things; hold fast that which is good." (1 Thessalonians 5:21, KJV)

15 KEY FORMULAS

All in one place

Quantity	Formula	Example on this sheet
Opportunity cost (PPF)	what you give up ÷ what you get	1 table = 4 chairs (B to C)
Equilibrium	set Qd = Qs; solve for P, then Q	120 − 10P = 20P − 30 → $5, 70
Price elasticity (midpoint)	[%ΔQ] ÷ [%ΔP], each % on the average	kettle corn −1.59
Income / cross-price elasticity	%ΔQ ÷ %Δincome; $\%\Delta Q_A \div \%\Delta P_B$	1.17 (normal); +0.83 (substitutes)
Total revenue	TR = P × Q	$4 × 100 = $400
Consumer / producer surplus	½ × base × height (straight lines)	245; 122.50
Tax incidence	buyers bear $P_b - P^*$; sellers $P^* - P_s$	$1.00 and $0.50 of $1.50
Deadweight loss	½ × tax × drop in quantity	½ × 1.50 × 10 = 7.50
Utility maximum	$MU_A/P_A = MU_B/P_B$; all income spent	8/2 = 4/1
Average costs	AFC = TFC/Q, AVC = TVC/Q, ATC = TC/Q	ATC(6) = 168 ÷ 6 = 28
Marginal cost	MC = ΔTC ÷ ΔQ	7th batch: 206 − 168 = 38
Profit	(P − ATC) × Q	(30 − 28) × 6 = 12
Profit-maximizing output	MR = MC (perfect competition: P = MC)	6 batches at $30
Shutdown / break-even	P < min AVC: shut; P = min ATC: zero profit	$16.50; $28
Linear monopoly MR	P = a − bQ → MR = a − 2bQ	MR = 200 − 4Q
Marginal revenue product	MRP = MP × MR (= MP × P if competitive)	6 × $20 = $120
Hire rule	MRP = MRC (= the wage if competitive)	4 barbers at $110
Economic profit	TR − explicit − implicit costs	64,000 − 41,000 − 26,500 = −3,500
Gini coefficient	A ÷ (A + B) from the Lorenz curve	0.38

16 GRAPHS & COMMON ERRORS

Nine common slips

Slip	Right way
"Price went up, so demand fell"	quantity demanded fell (a slide); demand shifts only for TRIBE causes
A price change shifts its own curve	it moves you **along** the curve
Elasticity = slope	slope is constant on a straight line; elasticity changes along it
Counting fixed costs in the output decision	only MC and MR decide how much
Shutting down whenever there is a loss	shut down only when **P < AVC**
Monopoly charges the highest possible price	it picks Q where MR = MC, then the price demand allows
A ceiling above the market price causes a shortage	a ceiling bites only **below** equilibrium
Accounting profit = economic profit	subtract implicit costs too
Taxing sellers means sellers pay it all	the less elastic side bears more

Which graph?

Question asks about…	Draw
a shortage, surplus, ceiling or floor	supply and demand with a horizontal price line
who pays a tax; deadweight loss	supply shifted up by the tax; shade the wedge and the triangle
profit, loss or shutdown	MC, ATC, AVC and a flat P = MR line
the long run in competition	market and firm side by side; entry shifts S
monopoly output and price	D, MR (twice as steep), MC; read P up on D
spillovers	MSC vs MPC (or MSB vs MPB); shade the DWL
hiring	MRP bars or curve with a flat wage line

Drawing a graph

- Label both axes (P and Q) and every curve.
- Mark the starting equilibrium E_1, shift **one** curve with an arrow, mark E_2.
- Drop dashed lines to both axes and read off P and Q.
- Shade areas (surplus, DWL, profit) and name them.

Reading graphs

Marginal = slope MC is the slope of TC; MR the slope of TR

Average total ÷ quantity

Area height × width (rectangle), ½ × height × width (triangle)

MEMORY TRICK **MR = MC everywhere**

Every market structure picks output the same way: **MR = MC**. What changes is the shape of MR (flat for a price taker, sloping down for everyone else).