Oligopoly and Game Theory

AP Microeconomics | Unit 4 | collusion, dominant strategies, Nash equilibrium

1. Oligopoly

Three features

A **few large firms**; **high barriers to entry**; and the firms are **interdependent**: each firm's profit depends on what its rivals do.

Collusion: firms agree on price or output. A group that colludes is a **cartel**. Together they act like one monopoly (less output, higher price, more total profit), but each member can earn even more by secretly breaking the agreement.

2. Reading a payoff matrix

Firm A picks a row, Firm B picks a column. In each cell, A's profit is first and B's is second ($ millions). *The question always says whose number is first: check it.*

	B: High	B: Low
A: High	\$50, \$50	\$20, \$70
A: Low	\$70, \$20	\$30, \$30

Dominant strategy

The choice that is best **whatever the other firm does**.
Firm A (compare A's numbers inside one column): if B plays High, $70 > 50$; if B plays Low, $30 > 20$. Low wins both times, so **Low is A's dominant strategy**.
Firm B (compare B's numbers inside one row): $70 > 50$ and $30 > 20$. Low is dominant for B too.

3. Nash equilibrium and cheating

Nash equilibrium

A cell in which each firm is doing the best it can **given what the other is doing**: neither can gain by changing on its own. Underline each firm's best response; the equilibrium is the cell with **both numbers underlined**.

Here: (Low, Low), \$30 each. If A alone switched to High it would get \$20.

Yet (High, High) pays \$50 each. Each firm choosing what is best for itself leaves both worse off: a **prisoner's dilemma**. If the firms collude on High, either one can cheat and raise its profit from \$50 to \$70, so cartels tend to break down, even though the agreement gives the highest combined profit (\$100).

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4. When a firm has no dominant strategy

	B: Advertise	B: Do not
A: Advertise	\$40, \$30	\$60, \$20
A: Do not	\$30, \$50	\$50, \$60

- **A**: $40 > 30$ and $60 > 50$. Advertise is dominant.
- **B**: if A advertises, $30 > 20$ (advertise); if A does not, $60 > 50$ (do not). B's best choice changes, so B has **no dominant strategy**.
- A will advertise; B's best response to that is to advertise. **Nash equilibrium: (Advertise, Advertise)**, A earns \$40 and B earns \$30.

5. Two equilibria, collusion and the law

Two Nash equilibria. Two firms pick a charger plug; matching pays. Payoffs (A, B): X,X \$40,\$30; Y,Y \$30,\$40; a mismatch \$10,\$10. A's best choice is X if B picks X and Y if B picks Y, and the same holds for B, so *neither* firm has a dominant strategy. Two cells have both numbers underlined: (X, X) and (Y, Y) are both Nash equilibria.

Collusion and the law. Explicit collusion (an actual agreement to fix prices or output) is illegal under antitrust law; tacit collusion (matching a rival's price without any agreement) is legal. A secret price cut steals rivals' customers until they notice; then, being interdependent, they match it almost immediately. The more firms in a cartel, the harder it is to monitor, and the less one firm's extra output moves the price, so cheating pays more: collusion is harder to sustain.

Where students lose points

1. Reading the wrong firm's number: check whose payoff is listed first.
2. Comparing along the wrong line: the row player compares within a column, the column player within a row.
3. Calling the cell with the biggest numbers the Nash equilibrium.
4. Saying there is no Nash equilibrium because one firm has no dominant strategy.
5. Asked for the profit, answering with the strategy (or the reverse).

Now practise it

Theory sticks once you use it. On **sad-academy.com** you'll find practice questions for this exact subtopic in the AP format, and an AI that grades your free-response answers against the scoring guidelines, the way an AP reader would.

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