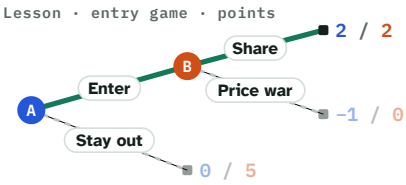
Who moves first?

Ben owns the only shop in town and threatens a price war (prices so low that neither shop earns) if Ana opens next door. When players take turns, draw the game as a tree and solve it backward: Ben would share, so the threat is empty and Ana opens. A threat counts only if carrying it out is the best reply when the time comes.

1 The game tree

turns, left → right

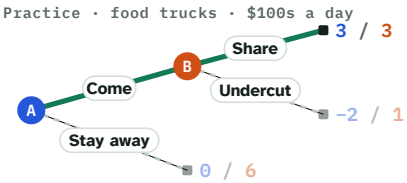
- Moves take **turns**, each player sees the earlier moves = **sequential game** → **game tree** (not a table) · **your move** first: open or stay out (never graded, never stored)
- Read left → right: **dot** = a player who chooses · **line** = a choice · **numbers at the end** = points `Ana / Ben`, **more is better**
- Lesson: Ana **stays out** 0 / 5 · **enters** → Ben **shares** 2 / 2 or **price war** –1 / 0

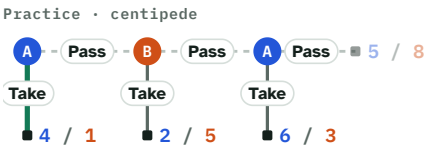


2 Backward induction

last decision first

- **Backward induction**: "solve the last decision first, then the one before it, using what each player would do"
- Ben, after entry: share 2 > war 0 → **share** ⇒ Ana: enter 2 > out 0 → **enter** ⇒ path Enter → Share, **2 / 2**
- At each dot read only the number of the player choosing there (Ana 1st, Ben 2nd) · "pass/enter" is worth what the next player will do
- Lend $5? no loan 5 / 5 · repay 8 / 8 · keep 0 / 12 → Ben keeps (12 > 8) → Ana **does not lend** · both prefer 8 / 8 = the trap of Lesson 1 · fix: contract, reputation
- Practice: food trucks → Ben shares (3 > 1) → Ana comes (3 > 0) → **3 / 3** · centipede → take 6 > 5 → Ben take 5 > 3 → Ana take **at once** 4 > 2 → **4 / 1** though 5 / 8 better for both

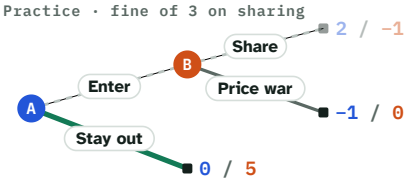




3 Threats

credible or empty

- **Empty threat**: "a threat the player would not carry out when the time comes, because carrying it out is not their best reply then" → Ben's war: 0 < 2 ⇒ Ana **ignores** it
- **Credible** = carrying it out **is** the best reply then (best reply = the move that pays the chooser most) · test: forget the words, compare the payoffs at that dot
- Make it real: **commitment** that changes your own payoffs · contract, fine F on sharing → Ben share `2 – F` · F = 3 → –1 < 0 → war → Ana stays out → Ben **5** (fine never paid) · credible when `F > 2` (F = 2 tie)
- Credible ✓ airline with empty seats, late fee in contract, factory already built · empty × teacher who must stay too, below cost for years, $5,000 suit for a $50 lawn
- Same game **at the same time** (table) → **two** equilibria (nobody gains by switching alone): 2 / 2 and Stay out / War 0 / 5 (Ben's tie 5 = 5) · the second rests on the empty threat → tree keeps **2 / 2** = **subgame perfect equilibrium** (Selten's name: no empty threat in any part of the tree)



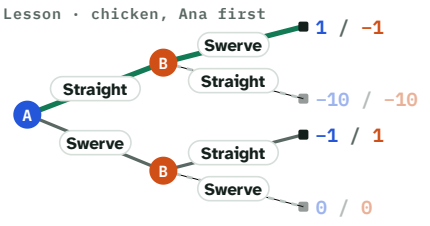
PRACTICE · SAME TIME · POINTS

	Ben Share	Ben War
Ana Enter	2 / 2	–1 / 0
Ana Out	0 / 5	0 / 5

4 Moving first

when it wins

- **First-mover advantage**: "the gain from moving first, when the other player must adapt to your move"
- Chicken (Lesson 3) as a tree, Ana first: straight → Ben –1 > –10 → swerves → **1 / –1** · a visible move that cannot be undone = **commitment**
- Moving **second** wins when seeing the move lets you beat it → rock-paper-scissors, penalty kick (keeper dives early → kicker shoots the other way)



5 Real cases

logic vs people

- **Reinhard Selten** (German economist, 1930–2016, Nobel **1994**, equilibria) · **chain store paradox** (**1978**): chain in many towns threatens every newcomer → logic: each threat empty → all enter · real chains **do** fight → reputation
- **Centipede game** (Robert Rosenthal, American economist, **1981**): take or pass, piles grow, named for its long row of turns → logic: take at once · lab (McKelvey & Palfrey **1992**): players **rarely** do
- Logic holds if both fully rational (always pick their best move) and each knows it · people trust, test, build reputations → repeated games, Lesson 5

Watch out: solve from the **end**, not the start · a loud or public threat is not credible by itself: compare payoffs at that dot · Ben's best reply after entry, not his favorite outcome (5 if Ana stays out) · a table can show equilibria a tree throws out · moving first is not always better