# How do you split the pie?

**Bargaining** = splitting a pie (the money at stake) by offers · solve it **backward** from the last offer · each side gets what its **"no"** is worth · **last mover**, **patient** player and better **outside option** → bigger share · real people refuse offers they find unfair.

## 1 One offer

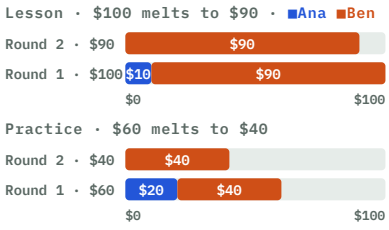
the ultimatum game

- **Your move**: $100 to split with a stranger · you offer $10, $30 or $50 · a no → both $0 (never graded or stored)
- **Ultimatum game**: "one offer, take it or leave it; a no leaves both with nothing" (Behavioral Lesson 7)
- Only dollars count → offer $10 → Ben: `$10 > $0` → **yes** · best reply = yes to anything above $0 ⇒ theory: offer almost nothing
- Real people → most offers **40–50%** · offers under **20%** → turned down about **half** the time

## 2 The shrinking pie

solve it backward

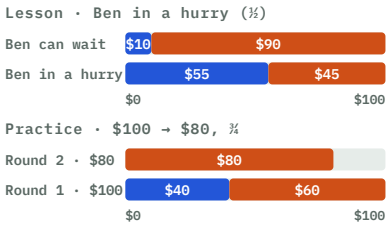
- Ana offers · Ben says no → pie melts **$100 → $90** · Ben offers · yes when a no pays no more
- **Backward induction** (Lesson 4): start at the last move · round 2 → Ana's no = $0 → she takes anything → Ben keeps **$90**
- Round 1 → Ben's no worth $90 → Ana offers **$90**, keeps **$10** ⇒ the last offer is worth a lot
- **Bargaining power**: "what each side gets if talks fail sets how much it can demand"
- Practice · $60 → $40 → Ben's no $40 → Ana keeps `60 − 40 = $20` · melts to $20 → Ana keeps **$40** (more melting → first offer keeps more)




## 3 Patience

who can wait

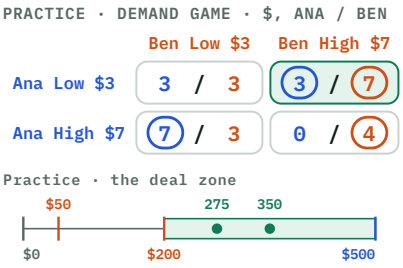
- Ben in a hurry: $1 next round = **50¢** today → his no = `90 × ½ = $45` → Ana offers $45, keeps **$55**
- **Patience**: "how little you lose by waiting a round: the less you lose, the more you can ask" ⇒ **the patient player gets more**
- **Ariel Rubinstein**: Israeli economist · **1982** · offers back and forth as long as it takes → more patient player, bigger share · our two rounds = simplified version
- Practice · $100 → $80, $1 next round = **75¢** → no = `¾ × 80 = $60` → Ana keeps **$40** · patient Ben → $80 → Ana **$20**




## 4 The outside option

BATNA

- **Outside option**: "what you get if the talks fail" · Ben's other job $40 → least he accepts **$40** → Ana keeps **$60**
- **BATNA** = best alternative to a negotiated agreement · **Roger Fisher**, **William Ury**, American negotiation scholars, Harvard · "Getting to Yes", **1981**
- Bike: buyer 2 pays $80 for sure → never sell to buyer 1 below **$80**
- Practice · **demand game** ($10, each writes $3 or $7 at once; sum > $10 → no deal: Ana $0, Ben a $4 job) → Ben High **dominant** = best whatever Ana writes (7 > 3, 4 > 3) → Ana Low (3 > 0) → **3 / 7** = **Nash equilibrium** (each move a best reply to the other) · without the job (0 / 0) → **two** equilibria, like **chicken** (Lesson 3: whoever gives way gets less)
- Practice · coffee machine: Ben sells elsewhere $200 · Ana buys new $500 → gain `500 − 200 = $300` → even split `200 + 150 = $350` · Ben's option falls to $50 → `50 + 225 = $275`




## 5 What helps your side

before the talk

- **Raises** your share: a second offer · the other side must close today · you can wait
- **Lowers** it: telling them you are in a hurry · your other buyer drops out · they get a rival offer
- Chain: better job for Ben → his no worth more → yes only to bigger offers → Ana keeps less
- Theory fits best when both sides care only about dollars · real people → an offer near half = safer, rarely turned down

**Watch out:** the split is set by what each **"no"** is worth, not by who is fairer or speaks first · in the last round the answer is yes to anything · showing a hurry makes your no worth less · real people still refuse offers they find unfair