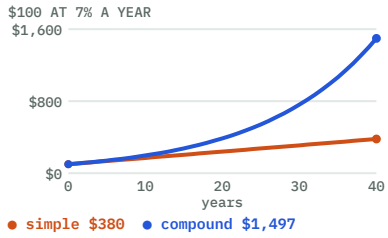
How does $100 become $200 without working?

Simple against compound interest; the formula one year at a time; the rule of 72 for money and for prices; why the start age matters; the real return and where the 7% comes from.

1 Simple vs compound

interest on interest

- **Interest** = what a bank pays you for keeping your money → 10% a year on $100 = $10
- **Simple interest**: "interest paid only on the original amount, the same each year"
- **Compound interest**: "interest earned on the original amount and on the interest added before"
- $100 at 10%: year 1 → $110 both · year 2 → simple $120 vs compound **$121** (10% of $110 = $11) · year 3 → $130 vs $133
- $1,000 at 10%: $1,100 → $1,210 → **$1,331** vs simple $1,300 → gap $31 = interest on interest
- $100 at 7% for 40 years: simple **$380** vs compound **$1,497** ⇒ about **4 ×**; gap tiny at first, then ever wider



2 The formula

× 1.07 per year

- Rule in words: each year total × **1.07** = the 100% you had + 7% more
- `100 × 1.07 = 107` → `100 × 1.07 × 1.07 ≈ 114` → after t years 100×1.07^t
- $100 at 7%: 10 years ≈ **$197** · 20 ≈ $387 · 30 ≈ $761 · 40 ≈ **$1,497**

3 Rule of 72

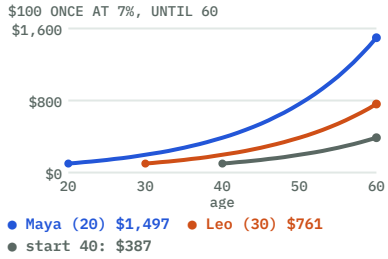
years to double

- `years to double ≈ 72 ÷ yearly rate in %` → rough shortcut, close enough for everyday sums · cousin of the rule of 70 (Macro Lesson 10)
- 6% → 12 years · 7% → about 10 · 8% → 9 · 9% → 8
- Forwards: $500 at 6% for 36 years → 36 ÷ 12 = 3 doublings → 1,000 → 2,000 → **≈ $4,000** (exact $4,074)
- Backwards, prices: **inflation** (prices rising) 3% a year → 72 ÷ 3 ≈ **24 years** to double → $500 in a shoebox then buys what $250 buys today

4 Time

the ingredient

- $100 once, 7%, until 60: MAYA starts 20 → **$1,497** · LEO starts 30 → **$761** ⇒ 10 years = one doubling ⇒ about **2 ×**
- Leo at 40 → 20 years → two doublings → **$387** ⇒ Maya ≈ 4 ×
- Catch up = put in more: 10 years late → **≈ $200** · 20 years late → **≈ $400** · same $100, fewer years → cannot catch up by 60
- Every 5 years of waiting: $1.07^5 \approx 1.4$ → close to 30% of the result lost (1 – 1 ÷ 1.4)
- **Time horizon**: "how long money stays invested; at the same rate, a longer one grows far more" · your start age → $\$100 \times 1.07^{(60 - \text{age})}$



5 Where it works

interest stays in

- COMPOUND interest added and left in: savings account · an unpaid card bill → compounds **against** you (Lesson 3)
- SIMPLE interest always on the same first amount: interest paid out and spent · friend pays 5% of $1,000 each year
- NO GROWTH shoebox · 0% account → dollars same, **buying power** (what money can buy) shrinks as prices rise

6 The evidence

where 7% comes from

- Aswath Damodaran (finance professor, New York University): US **stocks** (small shares of a company) of the 500 biggest firms (a list called the S&P 500) + **dividends** (profits paid to owners) put back in, 1928-2025 → ≈ **10%** a year in money terms · inflation ≈ **3%**
- **Real return** = `return − inflation`, roughly → 10 – 3 ≈ **7%** · bank at 2% with prices +3% → 2 – 3 ≈ **–1%**: more dollars, less to buy (Lesson 5)
- **Average** over almost a century ≠ promise: single years from big gains to losses of more than a third (Lesson 6) · nothing sure about the future

Watch out: "a small start can wait" → 10 years late ≈ half the result · and compound ≠ adding the same 7% of the first $100: each year multiplies the **whole** total

This is a lesson, not financial advice. It shows what the evidence says about choices like these; what is right for you depends on your life.