

[Complete Guide](#)

Compound Interest Visualizer & Wealth Growth Kit

Compound interest is the only financial force that rewards you for doing nothing after making one good decision—starting early and staying invested. The problem is that its impact is invisible for years and then enormous, which makes it easy to undervalue when you are young and easy to regret when you are older. This kit turns the math into visible numbers so you can see exactly how much an extra decade of investing is worth, how inflation quietly reduces what your future balance actually buys, and how the Rule of 72 lets you estimate doubling time for any rate in your head. Understanding the formulas is not an academic exercise; it is how you evaluate every "wait and see" decision with real stakes attached.

1. Foundation

Two formulas drive everything in this kit, and both are worth knowing exactly. The first is the future value of a lump sum: $FV = PV \times (1 + r)^n$. PV is the present value (the amount you invest today), r is the periodic interest rate, and n is the number of periods. If you invest \$10,000 at 7% per year for 30 years: $FV = \$10,000 \times (1.07)^{30} = \$10,000 \times 7.612 = \$76,123$. The second formula is the future value of a regular series of contributions (an annuity): $FV = PMT \times [(1 + r)^n - 1] / r$. PMT is the payment per period, r is the rate per period, and n is the number of periods. If you contribute \$500 per month for 30 years at 7% annual return ($r = 7\%/12 \approx 0.5833\%$ per month, $n = 360$ months): $FV = \$500 \times [(1.005833)^{360} - 1] / 0.005833 = \$500 \times [7.612 - 1] / 0.005833 = \$500 \times 1,133.5 = \$566,765$. These two formulas—lump sum and annuity—are the only math behind every projection in this kit.

The Rule of 72 is the fastest compound-interest shortcut you will use for the rest of your financial life. Divide 72 by the annual interest rate to find the approximate years it takes to double a sum of money. At 6%: $72/6 = 12$ years to double. At 8%: $72/8 = 9$ years. At 10%: $72/10 = 7.2$ years. At 3% (a savings account or conservative bond): $72/3 = 24$

years. At 12% (credit card debt): $72/12 = 6$ years—meaning a credit card balance doubles every 6 years if you make no payments. The Rule of 72 also works in reverse: if you want your money to double in 10 years, you need a 7.2% return. This makes it instantly useful for evaluating whether a projected return is realistic, whether debt elimination should come before investing, and whether a financial product's promised yield is meaningful.

Lump-sum growth visualizer using $FV = PV(1+r)^n$ across multiple rates and time horizons, showing the curve of compounding against a linear growth comparison. The visual makes the inflection point of compounding clear: growth is slow and nearly linear in the first decade, then accelerates sharply in the second and third decades. A \$50,000 investment at 7% grows to \$98,358 by year 10, \$193,484 by year 20, and \$380,613 by year 30. The amount earned in years 21 through 30 (\$187,129) is nearly three times the amount earned in years 1 through 10 (\$48,358), even though the time period is the same. That acceleration is why interrupting compounding—selling, withdrawing, switching accounts—in the middle decades destroys wealth disproportionately.

Regular contribution growth calculator using $FV = PMT[(1+r)^n - 1]/r$ that shows total contributions versus total interest earned, making the "time versus money" tradeoff explicit. At \$300/month for 30 years at 7%, total contributions are \$108,000 and total growth is \$257,310 for a final balance of \$365,310. The interest earned exceeds the money contributed by more than 2:1. At \$300/month for only 20 years, total contributions are \$72,000 and total growth is \$82,286 for a balance of \$154,286—the growth is less than the contributions. The decade between 20 and 30 years is where compounding shifts from underwhelming to extraordinary.

Age-22-versus-age-32 comparison tool that shows the cost of a 10-year delay in concrete dollars, using a standardized \$300/month contribution at 7% annual return. Investor A starts at age 22 and contributes \$300/month for 43 years until age 65. Investor B starts at age 32 and contributes \$300/month for 33 years until age 65. Investor A's balance at 65: approximately \$1,214,000. Investor B's balance at 65: approximately \$572,000. Investor A ends up with \$642,000 more despite contributing only \$36,000 more in total ($\$3,600/\text{year} \times 10$ additional years). The extra \$36,000 in contributions produced \$606,000 in additional wealth through compounding. The 10-year head start is worth roughly 18 times its face value by age 65.

2. Step-by-Step System

1

Build your baseline projection using the lump-sum formula

Start by applying $FV = PV \times (1 + r)^n$ to whatever you have saved already—your 401(k) balance, brokerage account, or savings account total. Use 7% as a baseline nominal return for a diversified equity portfolio, 5% for a balanced portfolio, and 3% for cash or bonds. Run the projection to age 65 or your target retirement date. For example, if you are 35 with \$45,000 in a 401(k): $FV = \$45,000 \times (1.07)^{30} = \$45,000 \times 7.612 = \$342,540$ from that balance alone, before any future contributions. That number grounds the analysis in your real situation and tells you what your existing savings will become if you simply let compounding work without adding anything more. Most people who see this number for the first time are surprised in one of two directions: either the future balance is larger than expected and they feel reassured, or it is smaller than they need and they understand concretely why they need to contribute more.

2

Add regular contributions using the annuity formula and find the gap

Now layer in your planned monthly contributions using $FV = PMT \times [(1 + r)^n - 1] / r$. If you contribute \$600 per month for 30 years at 7%, the formula produces: $\$600 \times [(1.005833)^{360} - 1] / 0.005833 \approx \$600 \times 1,133.5 \approx \$680,100$. Add the lump-sum projection from Step 1 to get the total projected balance. Compare that total to your retirement income target—a standard approach is to multiply your desired annual retirement income by 25 (the inverse of the 4% safe withdrawal rate). If you want \$60,000 per year in retirement, you need approximately \$1,500,000. If your projection shows $\$342,540 + \$680,100 = \$1,022,640$, the gap is \$477,360. The gap tells you how much more you need to save, or how much longer you need to work, or what combination of both closes the shortfall.

3

Apply the Rule of 72 to every rate in your financial picture

Run the Rule of 72 on every interest rate that currently affects you—investment return, savings account yield, and any debt. Your 7% investment account doubles every 10.3 years. A 5% I-Bond doubles every 14.4 years. A 1% savings account doubles every 72 years—barely meaningful in real terms. A 19.99% credit card doubles every 3.6 years. A 6% student loan doubles every 12 years. These calculations make the priority order of financial decisions much clearer: paying off a 19.99% credit card is equivalent to earning 19.99% guaranteed on your investments, which no diversified portfolio reliably delivers. The Rule of 72 applied to your personal balance sheet—not just to theoretical investment returns—is one of the most useful 30 seconds of personal finance math available.

4

Run the inflation adjustment to find the real purchasing power of your projected balance

A projected balance of \$1,200,000 in 30 years sounds like a lot, but it buys significantly less than \$1,200,000 today. To find the real (inflation-adjusted) value of a future nominal balance, use: $\text{Real FV} = \text{Nominal FV} / (1 + \text{inflation})^n$. At 3% average annual inflation over 30 years: $\text{Real FV} = \$1,200,000 / (1.03)^{30} = \$1,200,000 / 2.427 \approx \$494,500$ in today's dollars. That means a \$1.2M nominal balance in 30 years has roughly the same purchasing power as \$494,500 today. To check whether your target is adequate, compare this real value to your current spending. If you currently spend \$60,000 per year and expect to spend roughly the same in retirement, you need your real balance to support $\$60,000 \times 25 = \$1,500,000$ in today's dollars—meaning your nominal balance at retirement needs to be $\$1,500,000 \times (1.03)^{30} \approx \$3,640,000$. Inflation doubles your nominal target over a 30-year horizon at 3%.

5

Run the age-22 versus age-32 comparison to quantify the cost of delaying

Use the kit's comparison tool with your own numbers, not just the standard \$300/month example. Choose your actual current monthly contribution target and run it from two starting dates: today, and five years from today. Apply the annuity formula: FV_1 starting today for n years, and FV_2 starting five years later for $n-5$ years. The difference is the cost of the delay, which for most reasonable contribution levels and time horizons will range from \$80,000 to \$400,000 at retirement. Make this calculation concrete by dividing the cost of delay by the number of months of delay: if a 5-year delay costs \$200,000 at retirement and the delay is 60 months, each month of delay cost \$3,333 in future wealth. That number tends to reframe the "I'll start next year" decision more effectively than any abstract advice about the importance of starting early.

6

Identify the single lever with the highest impact on your specific projection

After running all the projections, identify whether the biggest gap in your model is caused by: starting too late (time horizon is short), contributing too little (PMT is below what the target requires), earning too low a return (allocation is too conservative for the time horizon), or paying too much in fees (expense ratios above 0.5% on a \$200,000 portfolio cost \$1,000/year before inflation). For most people under 45, time horizon and contribution rate are the dominant levers. For people over 55, return assumption and withdrawal rate are often more important than increasing contributions because there is limited time for compounding to amplify additional contributions. Document the single largest lever in your analysis and focus the execution plan on that one variable before addressing the others.

3. Key Worksheets & Checklists

These worksheets lock the kit's calculations into an actionable plan. Use the setup table to record your current balances and assumptions, the checklist to verify you have run each projection correctly, and the 30-day tracker to move from analysis to implemented changes in your accounts or contribution levels.

1. Compound Interest Setup Worksheet

Current investable balance (PV)	Total of all invested assets: 401(k), IRA, brokerage. Exclude emergency fund and home equity. This is the starting PV in the lump-sum formula.
Monthly contribution (PMT)	Current total monthly contribution across all investment accounts. Verify this number from payroll deductions plus any brokerage auto-deposits.
Assumed annual return (r)	Use 7% for a diversified equity portfolio, 5% for balanced, 3% for conservative. Document which allocation justifies this rate.
Years to target date (n)	Years until retirement or the specific goal date. Confirm this is consistent across both the lump-sum and annuity calculations.
Projected nominal balance	FV (lump sum) + FV (annuity). This is the headline number before inflation adjustment.
Projected real balance (inflation-adjusted)	Nominal balance $\div (1.03)^n$. This is what the nominal balance buys in today's dollars at 3% inflation.

2. Execution Checklist

- Apply $FV = PV \times (1+r)^n$ to your current total investable balance at three rates: 5%, 7%, and 9%. The range shows your sensitivity to return assumptions.
- Apply $FV = PMT \times [(1+r)^n - 1]/r$ to your current monthly contribution at 7%. Confirm the formula result matches your kit's calculator output.
- Run the Rule of 72 on every interest rate in your financial life: investment return, each debt's interest rate, and your savings account yield. List them in order from highest to lowest.
- Calculate the inflation-adjusted value of your projected balance: $Nominal\ FV \div (1.03)^n$. Confirm this real balance is sufficient to support your target annual spending at a 4% withdrawal rate.
- Run the age-22-vs-32 comparison (or equivalent for your age) to quantify the dollar cost of a 5-year delay. Divide the cost by the number of months to get a per-month delay cost.
- Identify your biggest lever: time, contribution rate, return assumption, or fee reduction. Document it and set one specific action to address it.
- Verify your investment expense ratios. Mutual funds and ETFs above 0.5% in a long-term account should be compared to index alternatives with expense ratios under 0.15%.

3. 30-Day Follow-Through Tracker

Window	Action	Evidence Complete
Week 1	Gather all current account balances. Calculate the lump-sum FV at 7% for your years-to-retirement. Note the real (inflation-adjusted) value of that projection.	Balance total confirmed; lump-sum projection completed at 5%, 7%, and 9%; inflation-adjusted real value noted.
Week 2	Add the annuity calculation using current monthly PMT. Identify the gap between projected total balance and the 25x your target annual spending. Run the Rule of 72 on all your rates.	Annuity projection completed; funding gap calculated; Rule of 72 applied to every rate in your financial life.
Week 3	Run the delay-cost comparison. Increase contribution by at least \$50/month if a gap exists. Check expense ratios on all investment holdings and identify any to replace.	Delay cost calculated per month; contribution increase implemented or contribution change scheduled; expense ratios reviewed.
Week 4	Set an annual review reminder. Document the current projection, the key assumptions, and the single biggest lever identified. Review again in 12 months to update	Annual calendar reminder set; projection documented with assumptions; biggest lever named and action assigned.

Window	Action	Evidence Complete
	balances and recheck assumptions.	

4. Common Mistakes

Using nominal projections without inflation adjustment to evaluate retirement readiness

A projected balance of \$1,500,000 in 35 years is not the same as having \$1,500,000 today. At 3% annual inflation over 35 years, \$1,500,000 nominal buys approximately \$530,000 in today's purchasing power. Always run the inflation adjustment—dividing the nominal FV by $(1.03)^n$ —before concluding that a projection is adequate for retirement spending. Many people are lulled into complacency by large nominal numbers that represent modest real purchasing power.

Confusing the cost of delay in abstract terms rather than calculating it concretely

Saying "starting early is important" changes no behavior. Calculating that a 5-year delay in starting \$400/month contributions costs \$318,000 at retirement at 7%, or \$5,300 per month of delay, is specific enough to motivate action. Run the exact numbers for your situation. The abstract advice to "start early" has been repeated for decades without producing earlier starting behavior; your personal delay cost in dollars tends to be more persuasive than the general principle.

Applying a consistent return assumption without stress-testing at lower rates

A 7% average annual return is a reasonable long-run assumption for a diversified equity portfolio, but the actual path is volatile: years of 20%+ gains followed by years of –30% losses. Always run the projection at 5% alongside 7% and 9%. If the 5% scenario does not meet the target, the plan is fragile. Investors who only build projections at optimistic return assumptions are systematically overconfident about their retirement readiness and systematically under-saved when markets deliver average or below-average returns.

Focusing on savings rate while ignoring investment expense ratios

A 1% annual expense ratio on a \$300,000 portfolio costs \$3,000 per year in explicit fees, plus the compounding cost of those fees not being invested. Over 20 years at 7%, \$3,000 per year in saved expenses compounds to approximately \$123,000 in additional wealth—equivalent to roughly 4 extra years of \$600/month contributions. Checking and minimizing expense ratios is not a detail; it is a high-leverage action with the same compounding math as increasing contributions, except it costs nothing except one afternoon of account reviews.

5. Next Steps

Run the three core projections today—lump-sum FV, annuity FV, and inflation-adjusted real value—using your actual current balances and contribution rates. The gap between your projected balance and your 25× spending target is the number you are trying to close. Identify whether time, contribution rate, return, or fees is the dominant lever, then take one action on that lever before the week is over. Set an annual review reminder and revisit the projections each year with updated account balances.

- Apply $FV = PV(1+r)^n$ to your current total investable balance at 7% and note the result.
- Add your annuity projection and check whether the combined total, adjusted for inflation, supports 25× your target annual spending.
- Run the Rule of 72 on your highest-interest debt and compare the guaranteed "return" of paying it off to your investment return assumption.
- Check expense ratios on every fund you own—anything above 0.5% on a long-term account deserves replacement with a lower-cost index alternative.

- Set the annual review reminder now so you do not rely on motivation to revisit the numbers—the best financial plans have built-in review dates.

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