Unit 10 · Retirement & Inflation Cheat Sheet

Unit 10 focus: model inflation, real value and retirement accounts

1 INFLATION VOCABULARY

Term	Meaning / quick example
Inflation	Rise in the general price level over time.
Nominal dollars	Dollars in the year they are received.
Real dollars	Purchasing power expressed in a chosen base year.
CPI	Price index for a specified consumer basket; personal costs may differ.

2 FUTURE PRICE

$F = C(1+f)^t$. C = today's price dollars; f = annual decimal inflation; t = years.

Example: A $100 purchase; 3% inflation for 10 years.
Factor: $1.03^{10} \approx 1.343916$
Future price: $100(1.03)^{10} \approx 134.39$

Answer: About $134.39 in year 10

3 BRING DOLLARS BACK TO TODAY

$$C = \frac{F}{(1+f)^t}$$

F = future dollars; f = annual decimal inflation; t = years; C = today's purchasing power.

$50,000 received in 20 years at 2.5% inflation:
$\frac{50{,}000}{1.025^{20}} \approx 30{,}513.55$

About $30,513.55 today

Use the same base year when comparing amounts.

4 CPI & REAL RETURN

$$\text{Inflation} = \frac{\text{CPI}_2 - \text{CPI}_1}{\text{CPI}_1}$$

CPI 200 → 210 gives $\frac{10}{200} = 5\%$.

$$\text{Real return} = \frac{1+r}{1+f} - 1$$

r = nominal return, f = inflation; both decimal rates for the same period.

6% return, 2.5% inflation:
$\frac{1.06}{1.025} - 1 \approx 3.41\%$ real.

Subtracting inflation is a rough approximation.

5 ACCOUNT TAX TIMING

Account	General model
Traditional	Eligible contributions may reduce tax now; withdrawals generally taxed.
Roth	After-tax contributions; qualified withdrawals tax-free.
Employer match	Extra compensation; terms and tax treatment vary.
Vesting	How much employer money you keep when leaving.

Eligibility, limits, withdrawal rules and penalties depend on the plan and applicable rules. Compare after-tax amounts.

6 CALCULATE A MATCH

Employer matches 50% of contributions up to 6% of salary; assume all match is vested.

Example: $50,000 salary; employee contributes 6%.
Employee: $50{,}000(0.06) = 3{,}000$ yearly
Employer: $0.50(3{,}000) = 1{,}500$ yearly
Combined monthly: $\frac{4{,}500}{12} = 375$

Answer: $375 monthly goes to retirement

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More practice: compare tax timing, employer matches and saving plans

1 PROJECT REGULAR SAVING

$$F = D\frac{(1+i)^N - 1}{i}$$

D = end-of-month deposit dollars; i = monthly decimal return; N = months; F = future dollars.

$375 monthly for 42 years at hypothetical 6% nominal, compounded monthly:

$i = \frac{0.06}{12}, \quad N = 504$

About $851,310.08 future dollars

No starting balance, fees or tax; constant return and deposits.

2 INTERPRET THAT PROJECTION

Use the same $851,310.08 future balance and 42-year horizon; assume 2.5% annual inflation.

Example: What purchasing power does it represent?

Today's value: $\frac{851{,}310.08}{1.025^{42}} \approx 301{,}776.51$

Contributed: $375(504) = 189{,}000$ nominal dollars

Answer: About $301,776.51 today

3 ROTH OR TRADITIONAL?

Same $1,000 pretax earnings; both investments double. Eligible traditional deduction; 20% tax now, 10% on later withdrawal.

Example: Compare after-tax retirement dollars.

Traditional: $1{,}000(2)(1-0.10) = 1{,}800$

Roth: $1{,}000(1-0.20)(2) = 1{,}600$

Answer: Traditional gives $200 more here

4 WHEN COULD ROTH WIN?

If the later tax rate were 30% instead, with all other assumptions unchanged:

Traditional: $1{,}000(2)(0.70) = 1{,}400$

Roth: $1{,}000(0.80)(2) = 1{,}600$

Roth gives $200 more

Equal tax rates give equal after-tax results in this model. Actual choice also depends on eligibility, cash flow, flexibility and uncertain future rates.

5 SPENDING TARGET: A SCENARIO

$$\text{Savings target} = \frac{\text{annual spending gap}}{w}$$

Gap = spending minus other reliable income; w = assumed starting withdrawal fraction.

$40,000 spending − $16,000 other income = $24,000 gap.

At assumed 4%: $\frac{24{,}000}{0.04} = 600{,}000$.

A 4% scenario is not a guarantee. Include taxes, time horizon, fees and market risk; use consistent year dollars.

6 REMINDERS & MISTAKES

✓ Do remember

- Consider the full match when cash flow and plan terms allow.
- Review saving, inflation and return assumptions over time.

✗ Common mistakes

- Future balance = current wealth: convert purchasing power.
- Match is always yours immediately: check vesting.
- Social Security covers every cost: estimate your own gap.
- A fixed return is certain: test lower-return scenarios.