Finance formula sheet

Interest, borrowing and growth

Constant-rate educational models. No fees, taxes, inflation adjustment or irregular cash flows are included. A nominal interest rate is not necessarily a legally disclosed APR.

Compound growth

$$A = P\left(1 + \frac{r}{m}\right)^{mt}$$

P is the initial balance; r is the annual nominal rate as a decimal; m is compounding periods per year; t is years. No later deposits or withdrawals.

Simple interest

$$I = Prt, \qquad A = P + I$$

I is interest on the unchanged principal P. Use an annual decimal rate r and years t; this model does not compound interest.

Effective annual yield

$$y = \left(1 + \frac{r}{m}\right)^{m} - 1$$

Use annual nominal decimal rate r and m compounding periods per year. y is the decimal annual yield; interest stays in the account.

Level loan payment

$$M = \frac{Pi}{1 - (1+i)^{-N}}$$

P is principal; M is each payment. Use rate $i > 0$ per payment period and $N \geq 1$ end-of-period payments. For $i = 0$, use $M = P/N$.

Present value

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

F is one future amount after N periods; $i > -1$ is the discount rate per period. This does not value a series of separate cash flows.

Compound annual growth

$$g = \left(\frac{V_f}{V_0}\right)^{1/t} - 1$$

$V_0 > 0$ and $V_f > 0$ are beginning and ending values; $t > 0$ is years. g is a decimal rate. Intermediate cash flows are excluded.

Worked example / Two years of monthly compounding

Start with $P = 1000$ currency units at a nominal annual rate of 5%, compounded monthly for two years. There are no additional cash flows.

1. Write the annual rate as a decimal and count the compounding periods.

$$r = 0.05, \quad m = 12, \quad mt = 24$$

2. Substitute without rounding the periodic rate.

$$A = 1000\left(1 + \frac{0.05}{12}\right)^{24}$$

3. Round the final balance to two decimal places.

$$A \approx 1104.94, \qquad I \approx 104.94$$

The unrounded balance is used to find interest. Monthly deposits would require a different model; use the linked calculator for that scenario.

Source checks & next step

OpenStax: simple interest / OpenStax: compound interest and present value / OpenStax: loan payments

Check a savings scenario / Full previews and sources: toolarithm.com/resources/formula-sheets