Financial Math Formula Sheet

Interest and present value

Simple total	$A = P(1 + rt)$
Compound m times per year	$A = P(1 + r/m)^{mt}$
Continuous compounding	$A = Pe^{rt}$
Discount a future value	$P = A/(1 + r/m)^{mt}$

Use decimal annual rate r and time in years t. P is principal; A is total value.

Annuities and loan payments

Future value, end of period	$FV = PMT[(1 + i)^n - 1]/i$
Present value, end of period	$PV = PMT[1 - (1 + i)^{-n}]/i$
Level loan payment	$PMT = PV\ i/[1 - (1 + i)^{-n}]$

i is the rate per period, n is the count. At i = 0, use PV = FV = n PMT. Start-of-period values multiply by 1 + i.

Depreciation and returns

Fixed percentage loss	$A = P(1 - r)^t$
Straight-line loss per year	$(\text{cost} - \text{salvage})/\text{life}$
Net return on investment	$\text{ROI} = (\text{ending} - \text{cost})/\text{cost}$
Annualized growth	$g = (\text{ending}/\text{starting})^{1/t} - 1$

Use positive cost and starting values, t > 0 and a positive ending value for annualized growth.

Example: Compare interest

Simple total	$\$100 + \$100 \times 0.05 \times 2 = \$110$
Compound total	$\$100 \times 1.05^2 = \$110.25$

Start with $100 at 5% per year for 2 years. Compound interest is added once per year.

Find the sale price

Convert the discount	$15\% = 0.15$
Find the amount off	$\$60 \times 0.15 = \$9$
Subtract from the original	$\$60 - \$9 = \$51$

Check: a 15% discount means paying 85% of the original price.

Rates and percent models

Distance at a constant rate	$d = rt$
Scale a quantity	$\text{new} = \text{old} \times (1 + r)$
Find signed change	$r = (\text{new} - \text{old})/\text{old}$
Example: 80 to 68	$r = -12/80 = -15\%$

For a positive original value, a negative r is a decrease. Compare units before solving.