Reverse compound interest

Worked answers | Build & compare

Except for the explicit extension in question 8, use one starting deposit with no later deposits or withdrawals. Rates are constant; ignore tax, fees and inflation. Amounts are in currency units (the same maths applies to pounds, dollars or euros). Do not round intermediate calculations. Round final money answers to two decimal places, except where a minimum deposit is requested.

Single deposit: A = P(1 + r/n)^(nt); reverse: P = A/(1 + r/n)^(nt). A = target; r = nominal annual rate as a decimal; n = periods per year; t = years. For effective annual rate e, use P = A/(1 + e)^t.

1. Undo the growth

P = 1,210 / 1.10^2 = 1,000.00. Forward check: 1,000 x 1.10 x 1.10 = 1,210.00. Dividing by the growth multiplier reverses the two increases.

2. Count the monthly periods

Monthly rate i = 0.048 / 12 = 0.004 (0.4%). There are 12 x 5 = 60 periods. P = 18,000 / 1.004^60 = 14,166.081516... = 14,166.08. Using the unrounded principal gives a forward balance of exactly 18,000; rounding the principal can leave a small difference.

3. Same quoted percentage, different convention

A: P = 10,000 / (1 + 0.06/12)^36 = 8,356.45. B: P = 10,000 / 1.06^3 = 8,396.19. A needs 39.74 less (difference calculated before rounding). Its effective annual growth is (1.005^12 - 1) x 100 = 6.1678...%, above 6%. Do not divide the effective annual rate by 12; an equivalent monthly rate is 1.06^(1/12) - 1.

4. Diagnose a percentage mistake

Three 5% increases multiply by 1.05^3, not by 1.15: each increase applies to the new balance. Also, undoing a percentage increase means dividing by its multiplier, not subtracting that percentage from the final amount. P = 9,261 / 1.05^3 = 8,000.00. Check: 8,000 x 1.05^3 = 9,261.00.

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Worked answers | Diagnose & extend

Continue with the same assumptions. Question 8 is the only cash-flow extension. Keep unrounded working; round only the final answer.

5. Repair a formula

Use the decimal rate 0.036, not 3.6. The exponent must count monthly periods: 12 x 2 = 24, not 2. P = 15,000 / (1 + 0.036/12)^24 = 15,000 / 1.003^24 = 13,959.47.

6. A minimum means round up

Unrounded P = 5,000 / 1.04^5 = 4,109.635533... . Round UP to the next cent: 4,109.64. A deposit of 4,109.63 grows to 4,999.993267... (below the target); 4,109.64 grows to 5,000.005433... (above it). This comparison uses unrounded balances, not their displayed two-decimal values. Real accounts may round interest differently. Nearest-cent rounding happens to give the same answer here, but would fail whenever it rounds the required principal down. A minimum requires rounding up.

7. Test the boundary case

P = 7,500 / (1 + 0)^4 = 7,500.00. The growth multiplier is 1, so there is no interest and the starting and ending amounts are equal. There is no need to divide by the rate.

8. Spot a missing assumption

No. The target includes growth from later deposits as well as the initial deposit. S = 3,933.610496... . Subtract that future value first: P = (12,000 - S) / 1.005^36 = 6,740.64. The check is P x 1.005^36 + S = 12,000 using unrounded P. This extension requires a cash-flow model; the site's reverse calculator is for a single starting deposit, so use the main calculator for this question.