Reverse compound interest

Student worksheet | Build & compare

Name: _____ Date: _____

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

An account grows to 1,210.00 after two years at 10% a year, compounded annually. Find the original deposit. Check your answer by growing it forwards.

2. Count the monthly periods

A balance must reach 18,000.00 in five years at a nominal annual rate of 4.8%, compounded monthly. Write the monthly rate and number of periods, then find the starting deposit.

3. Same quoted percentage, different convention

To reach 10,000.00 in three years, compare (A) 6% nominal annual interest compounded monthly with (B) a 6% effective annual rate. Find each starting deposit. Which needs less, and why?

4. Diagnose a percentage mistake

A balance is 9,261.00 after three years at 5% a year, compounded annually. Sam says: 'Subtract 15% from the final balance: 9,261 x 0.85 = 7,871.85.' Explain two problems with Sam's method and find the correct principal.

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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

For a target of 15,000.00 in two years at 3.6% nominal annual interest compounded monthly, Lee writes P = 15,000 / (1 + 3.6/12)^2. Identify and correct both errors, then calculate P.

6. A minimum means round up

Find the minimum deposit in whole cents needed to reach at least 5,000.00 after five years at 4% a year, compounded annually. Interest is not rounded during the calculation. Would rounding to the nearest cent always guarantee the target? Explain.

7. Test the boundary case

The target is 7,500.00 after four years. The annual rate is 0%, with no other cash flows. Find P and explain what happens to the reverse-interest formula.

8. Spot a missing assumption

A target of 12,000.00 in three years has a nominal annual rate of 6%, compounded monthly, AND deposits of 100.00 at each month-end. Can P = 12,000 / 1.005^36 be used unchanged? Explain, then find P using S = 100 x (1.005^36 - 1) / 0.005 as the future value of the monthly deposits.