

Selecting between alternative financing options requires a rigorous analysis of cumulative future obligations. When comparing loans from informal lenders (such as a friend) versus institutional bodies (such as a commercial bank), the nominal rates, compounding time increments, and total durations must be mathematically standardized.

The primary tool for tracking periodic capital accumulation is the single-payment compound amount factor formula:

$$F = P(1 + i)^n$$

Where P is the principal amount borrowed, i is the actual interest rate per compounding period, and n represents the total number of compounding periods over the lifetime of the transaction.

You are given the option to borrow ₱4,300 you need for one year. Which of these will you pay lesser interest? To borrow from a friend at an interest rate of 1.2% [per month] or a loan from a bank at 20% per year?

From the problem statement and the companion review materials, we isolate two distinct financing alternatives over a uniform horizon of **1 year**:

- **Principal Sum (P):** ₱4,300
- **Option 1 (Bank Loan):** Nominal annual interest rate $r = 20\% = 0.20$ compounded annually ($m = 1, n = 1$ year).
- **Option 2 (Friend's Loan):** Periodic interest rate $i = 1.2\% = 0.012$ per month. Since the loan spans 1 year, the total number of compounding periods must be exactly $n = 12$ months.

Step 1: Calculate Future Worth of Bank Loan (F_{bank})

The bank loan is compounded annually over 1 year ($n = 1$):

$$F_{bank} = P(1 + i)^n = 4,300(1 + 0.20)^1 = ₱5,160.00$$

$$Interest_{bank} = 5,160.00 - 4,300 = ₱860.00$$

Step 2: Calculate True Future Worth of Friend's Loan (F_{friend})

The loan from the friend compounds monthly at 1.2% per month for exactly 12 months ($n = 12$):

$$F_{friend} = P(1 + i)^n = 4,300(1 + 0.012)^{12} = ₱4,961.74$$

$$Interest_{friend} = 4,961.74 - 4,300 = ₱661.74$$

Step 3: Determine Interest Savings

Subtracting the two true interest values shows the real savings achieved by choosing the friend's option:

$$Savings = Interest_{bank} - Interest_{friend}$$

$$Savings = 860.00 - 661.74 = \text{₱}198.26$$

The true essence of this problem lies in understanding the non-linear, exponential behavior of compound interest across different time structures, while exposing a critical operational truth: **nominal rates cannot be compared at face value without standardizing their compounding periods.**