

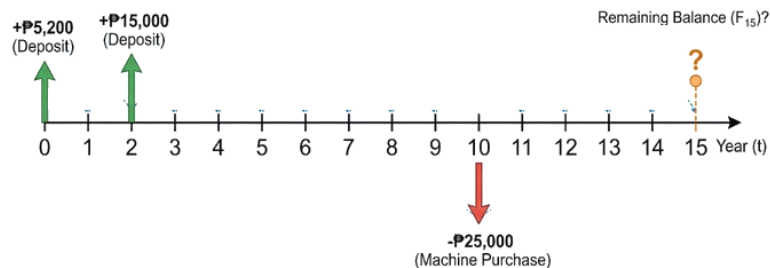
In engineering economic studies, managing financial portfolios often involves tracking multiple capital inflows (deposits) and outflows (withdrawals) occurring at irregular intervals across a multi-year horizon. To solve these dynamic cash tracking scenarios accurately, engineers rely on the principle of **Compound Interest**, where the interest earned during any compounding sub-period is continuously added back to the principal balance to earn additional interest in all subsequent periods.

When treating complex transaction sequences, a structured timeline or **Cash Flow Diagram** serves as an indispensable tool to visualize non-uniform monetary events from a unified vantage point. Every individual financial event must be systematically moved to a designated focal point using the fundamental single-payment compound amount factor formula:

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

Where P represents the initial value, i is the annual interest rate, and n represents the precise compounding duration measured in years.

Karding deposited ₱5,200 in an 11% account today. He intends to deposit another ₱15,000 at the end of two years. He plans to purchase in 10 years a machine worth ₱25,000. Calculate the money that will be left in his account 5 years after the purchase.



To break down this structural timeline for a textbook review, we chart out each financial event relative to today ($t = 0$):

- **Initial Deposit (P_0):** +₱5,200 at year $t = 0$
- **Secondary Deposit (P_2):** +₱15,000 at year $t = 2$
- **Capital Withdrawal (W_{10}):** -₱25,000 at year $t = 10$
- **Target Focal Date (t_{final}):** 5 years *after* the year 10 purchase, which means we must calculate the terminal balance remaining at year $t = 15$.
- **Annual Compound Interest Rate (i):** 11% = 0.11

Step 1: Accumulate Total Funds at Year 10 Before the Machine Purchase

We calculate the total accumulated savings available in the account right before making the machine purchase at year 10. Both individual cash deposits grow exponentially based on how long they remain untouched in the interest-yielding environment:

Growth of the initial ₱5,200 deposit: This sum compounds for the full 10-year period ($n = 10$):

$$F_{initial} = 5,200(1 + 0.11)^{10} = ₱14,765.01$$

Growth of the secondary ₱15,000 deposit: Since this cash is injected at the end of year 2, it only accumulates interest for the remaining 8 years of the cycle ($n = 10 - 2 = 8$):

$$F_{secondary} = 15,000(1 + 0.11)^8 = ₱34,568.07$$

Summing these individual compound future values yields the gross account balance at year 10:

$$Total\ Balance_{year10} = ₱14,765.01 + ₱34,568.07 = ₱49,333.08$$

Step 2: Deduct the Machine Asset Purchase Price

At year 10, Karding executes his plan and withdraws ₱25,000 cash to pay for the industrial machinery. This transaction reduces the active capital pool inside the interest account:

$$Remaining\ Balance_{year10} = ₱49,333.08 - ₱25,000 = ₱24,333.08$$

Step 3: Compound the Remaining Balance to the Terminal Target (Year 15)

The question asks for the remaining funds 5 years after the purchase occurs. The net remaining balance of ₱24,333.08 will continue sitting undisturbed in the account, compounding at the annual rate of 11% for another 5 years ($n = 5$):

$$F_{15} = 24,333.08(1 + 0.11)^5 = ₱41,002.62$$

The essence of Karding's financial strategy highlights the power of early capital investment combined with strategic compounding interest. By depositing funds early (at years 0 and 2), he allowed the **time value of money** to exponentially multiply his savings before executing a major withdrawal.

The vital lesson here is the importance of dynamic asset allocation and timeline foresight. In engineering economics, money is never stagnant; its value is tied to time. By leaving a residual balance untouched for another five years after a major equipment purchase, Karding maximized his terminal portfolio value, demonstrating that disciplined cash flow management secures long-term liquidity.