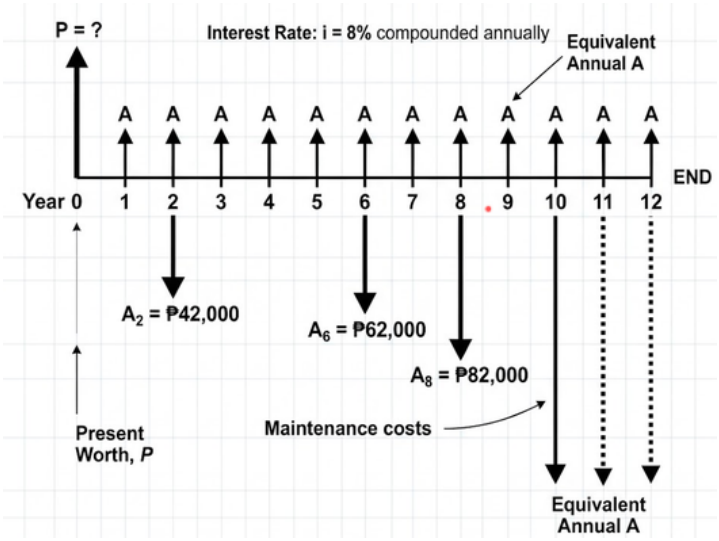

<u>Step 1:</u> Finding the Total Present Worth (P) of the Asymmetric Cash Flows

Before we can distribute the maintenance expenses into a uniform annual series (A), we must first consolidate the scattered single cash payments into an equivalent single value at the present time (t = 0). This is done by discounting each individual future maintenance cost back to Year 0 using the standard single-payment present worth formula:

$$P = F(1 + i)^{-n}$$

Given an annual interest rate of i = 8% = 0.08, we discount ₱42,000 from Year 2, ₱62,000 from Year 6, and ₱82,000 from Year 8:

$$P = \frac{₱42{,}000}{(1+0.08)^{2}} + \frac{₱62{,}000}{(1+0.08)^{6}} ++ \frac{₱82{,}000}{(1+0.08)^{8}}$$

$$P = ₱119,3807958$$

This represents the single lump-sum fund required today to cover all three future maintenance events.

<u>Step 2:</u> Converting Present Worth to an Equivalent Uniform Annual Series (A)

Now that we have the total present value, we apply the ordinary annuity formula to spread this sum evenly across the operational timeline. The relationship is given by:

$$P = \frac{A}{i}\left[1 - (1 + i)^{-N}\right]$$

Rearranging the equation to solve directly for the annual payment A yields:

$$₱119,3807958 = \frac{A}{0.08}\left[1 - (1 + 0.08)^{-12}\right]$$

A = ₱15,842.41

In professional engineering practice, municipal infrastructure systems, manufacturing plants, and heavy machinery experience irregular operational expenses. Generating an equivalent uniform annual series (A) is known as calculating the **Levelized Annual Cost**. It allows project managers to easily compare two entirely different machines—for example, comparing Machine X (which has low upfront costs but unpredictable, massive spikes in maintenance) against Machine Y (which has high upfront costs but a stable, flat-rate maintenance contract).