What is the difference between **potential** and **accounting** methods on amortizing methods?

1. Accounting Method

- This method assigns a **charge (or credit)** to each operation.
- Some operations may be **overcharged**, storing extra credit as a "prepaid" cost for future operations.
- Other operations may be **undercharged**, using the stored credit.
- The goal is to ensure that the **total amount charged** is always greater than or equal to the **actual cost**.

🔹 **Example**: Suppose we perform a sequence of insertions in a dynamic array that doubles in size when full. We can charge extra in earlier insertions to cover the occasional resizing cost.

2. Potential Method

- This method defines a **potential function** Φ\Phi that represents the stored work (like energy) in the system.
  - The amortized cost of an operation is calculated as:

$$\text{Amortized Cost} = \text{Actual Cost} + (\text{Change in Potential})$$

where:

$$\Delta\Phi = \Phi_{\text{after}} - \Phi_{\text{before}}$$

- If Φ\Phi decreases, it means we are using up the stored energy.

🔹 **Example**: In a stack with an occasional "expensive" multi-pop operation, we can define a potential function based on the number of elements in the stack, which allows us to distribute the cost smoothly.

Key Differences

Feature	Accounting Method	Potential Method
Concept	Pre-charging expensive operations	Using a potential function to model work storage
Viewpoint	Assigns "credits" to operations	Tracks potential energy of the system
How it works	Overcharges cheap operations to pay for expensive ones later	Uses change in potential to adjust amortized cost
Ease of Use	More intuitive	More mathematical but rigorous

Both methods give the **same amortized time bounds** but approach the analysis differently.

In the accounting amortized method do we assign same charge for all operations?

No, the **amortized method** in accounting (or finance) does not assign the same charge for all operations. Instead, it spreads out the cost of an asset, loan, or expense over time in a structured way.

There are different amortization methods, and the charge for each period can vary depending on which method is used:

1. **Straight-Line Amortization** – Assigns the same charge (equal expense) for each period. This is the simplest and most commonly used method.

2. **Declining Balance Method** – Assigns higher charges in the earlier periods and lower charges later (commonly used for assets that depreciate quickly).

3. **Annuity Method (Loan Amortization)** – In loan repayments, the total payment remains the same, but the portion covering interest and principal changes over time.

4. **Units of Production Method** – The charge varies based on the usage or output of the asset.

So, unless using the straight-line method, the charge is **not the same** for all operations. The choice of method depends on the financial strategy and accounting principles followed.