**Practice Question # 01**

A power distribution company wants to automate its billing system. The company supplies electricity to **residential, commercial, and industrial consumers**. The billing system should calculate the monthly electricity bill based on different tariff rates for each consumer type.

**Problem Statement:**

The company has **consumers** who are categorized as follows:

1. **Residential Consumers**: Charged at **$0.12 per unit**.
2. **Commercial Consumers**: Charged at **$0.20 per unit**.
3. **Industrial Consumers**: Charged at **$0.30 per unit**.

Additionally:

- If a **residential consumer** consumes more than **500 units**, a **surcharge of 5%** is applied.
- If a **commercial consumer** consumes more than **1000 units**, a **surcharge of 10%** is applied.
- If an **industrial consumer** consumes more than **2000 units**, a **surcharge of 15%** is applied.

The system should allow:

- **Registering a consumer** (with details like consumer name, ID, and units consumed).
- **Displaying the total bill** based on category-wise calculations.

**Implementation Requirements:**

- Create a **base class** Consumer with attributes like name, consumerID, and unitsConsumed.
- Create **derived classes** ResidentialConsumer, CommercialConsumer, and IndustrialConsumer which inherit from Consumer.
- Each derived class should have a method to **calculate the bill** based on the unit consumption and applicable surcharge.
- Create a main() function to allow user input and display the calculated bill.

**Practice Question # 02**

A city's **Traffic Control Authority** wants to implement an **automated fine management system** to track traffic violations and calculate penalties based on the type of vehicle. The system should differentiate between **cars, bikes, and trucks**, applying different fine structures for violations.

**Problem Statement:**

The system should categorize vehicles into three types:

1. **Cars**
    - **Speed Limit**: 80 km/h
    - **Fine Rate**: $5 per km/h over the limit
    - **Additional Fine**: If speed exceeds **120 km/h**, impose a **10% surcharge**
2. **Bikes**
    - **Speed Limit**: 60 km/h
    - **Fine Rate**: $3 per km/h over the limit
    - **Additional Fine**: If speed exceeds **90 km/h**, impose a **15% surcharge**
3. **Trucks**
    - **Speed Limit**: 70 km/h
    - **Fine Rate**: $7 per km/h over the limit
    - **Additional Fine**: If speed exceeds **100 km/h**, impose a **20% surcharge**

The system should:

- Allow **vehicle registration** (Owner Name, Vehicle ID, Vehicle Type).
- Record a **speed violation** (input actual speed).
- Calculate the **total fine** based on the vehicle type and excess speed.
- Apply **additional surcharge** for extreme overspeeding.
- Display violation details and the fine amount.

**Implementation Requirements:**

- Create a **base class** Vehicle with common attributes: ownerName, vehicleID, speed.
- Derive three classes: Car, Bike, and Truck from Vehicle.
- Each derived class should override a method to **calculateFine()**, applying specific fine rates and surcharges.
- Implement a **user interface in main()** to allow entering vehicle details, recording violations, and displaying fine details.

**Sample Input 1:**

```
Enter owner name: John Doe
Enter vehicle ID: ABC123
Select vehicle type (1: Car, 2: Bike, 3: Truck): 1
Enter the speed of the vehicle (in km/h): 130
```

**Sample Output 1:**

```
Traffic Violation Details:
--------------------------
Owner Name    : John Doe
Vehicle ID    : ABC123
Vehicle Type  : Car
Speed Recorded: 130 km/h
Speed Limit   : 80 km/h
Over-speeding : 50 km/h
Base Fine     : $250
Surcharge (10% for extreme speeding) applied: $25
Total Fine    : $275
```

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**Sample Input 2 (for a Bike exceeding 90 km/h):**

```
Enter owner name: Alex Smith
Enter vehicle ID: XYZ789
Select vehicle type (1: Car, 2: Bike, 3: Truck): 2
Enter the speed of the vehicle (in km/h): 95
```

**Sample Output 2:**

```
Traffic Violation Details:
--------------------------
Owner Name    : Alex Smith
Vehicle ID    : XYZ789
Vehicle Type  : Bike
Speed Recorded: 95 km/h
Speed Limit   : 60 km/h
Over-speeding : 35 km/h
Base Fine     : $105
Surcharge (15% for extreme speeding) applied: $15.75
Total Fine    : $120.75
```