ASSIGNMENT – 3.3

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B-10

TASK-1

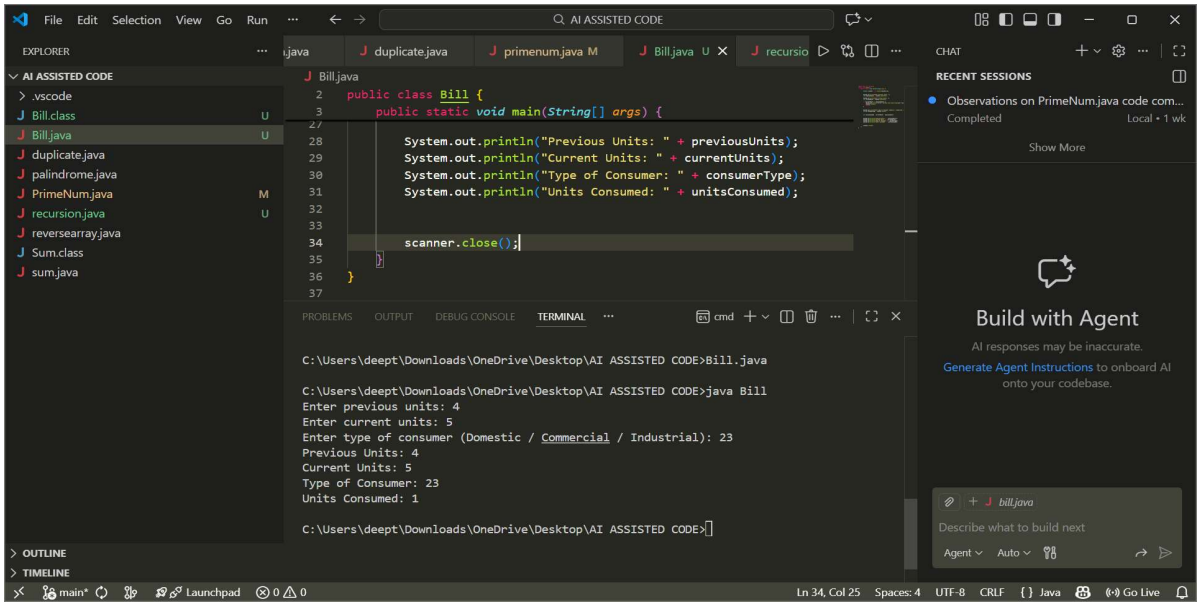
Prompt : Generate a Java program (only main method) to read Previous Units, Current Units, and Customer Type using Scanner. Calculate and display units consumed with simple comments.

CODE :

```
import java.util.Scanner;
public class Bill {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter previous units: ");
      int previousUnits = scanner.nextInt()
      System.out.print("Enter current units: ");
      int currentUnits = scanner.nextInt();
      if (currentUnits <= previousUnits) {
         System.out.println("Error: Current units must be greater than previous units.");
         scanner.close();
         return;
      }
      System.out.print("Enter type of consumer (Domestic / Commercial / Industrial): ");
      String consumerType = scanner.next();
      int unitsConsumed = currentUnits - previousUnits;
      System.out.println("Previous Units: " + previousUnits);
      System.out.println("Current Units: " + currentUnits);
      System.out.println("Type of Consumer: " + consumerType);
```

```
        System.out.println("Units Consumed: " + unitsConsumed)
        scanner.close();
    }
}
```

OUTPUT :



Analysis :

This task ensures that the electricity billing system captures accurate meter readings and customer information.
By calculating the difference between current and previous units, the program determines actual power consumption.
Implementing the logic directly in the main program keeps the execution straightforward and transparent.
This step is essential for building a reliable and realistic electricity bill generation system.

TASK -2

Prompt : Generate a Java program that calculates Energy Charges using units consumed and customer type (Domestic, Commercial, Industrial) with optimized if-else conditions and clear output.

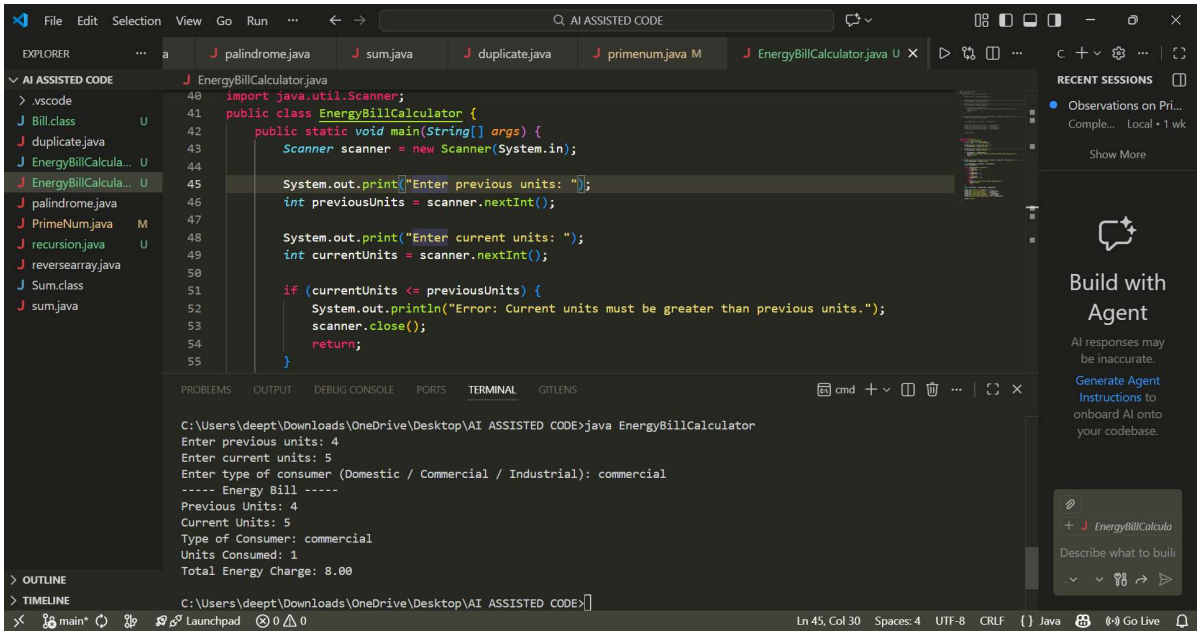
CODE :

```
import java.util.Scanner;
```

```
public class EnergyBillCalculator {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);
      System.out.print("Enter previous units: ");
      int previousUnits = scanner.nextInt();

      System.out.print("Enter current units: ");
      int currentUnits = scanner.nextInt();

      if (currentUnits <= previousUnits) {
         System.out.println("Error: Current units must be greater than previous units.");
         scanner.close();
         return;
      }

      System.out.print("Enter type of consumer (Domestic / Commercial / Industrial): ");
      String consumerType = scanner.next();

      int unitsConsumed = currentUnits - previousUnits;
      double chargePerUnit;

      switch (consumerType.toLowerCase()) {
         case "domestic":
            chargePerUnit = 5.0;
            break;
         case "commercial":
            chargePerUnit = 8.0;
            break;
         case "industrial":
            chargePerUnit = 10.0;
            break;
         default:
            System.out.println("Error: Invalid consumer type.");
            scanner.close();
            return;
      }

      double totalCharge = unitsConsumed * chargePerUnit;

      System.out.println("----- Energy Bill -----");
      System.out.println("Previous Units: " + previousUnits);
      System.out.println("Current Units: " + currentUnits);
      System.out.println("Type of Consumer: " + consumerType);
      System.out.println("Units Consumed: " + unitsConsumed);
      System.out.printf("Total Energy Charge: %.2f\n", totalCharge);

      scanner.close();
```

```
    }
}
```

OUTPUT :



Analysis :

In Task 2, the program is extended to calculate energy charges based on the number of units consumed and the type of consumer. Conditional logic is used to apply different charge rates for domestic, commercial, and industrial users. This ensures that billing follows realistic tariff rules. Optimizing the conditions improves code clarity and makes the billing logic easy to understand and modify.

TASK – 3

Prompt : *Generate* a *Java* program using user-defined methods to calculate *Energy Charges* and *Fixed* Charges, return values, and display the results with clear comments.

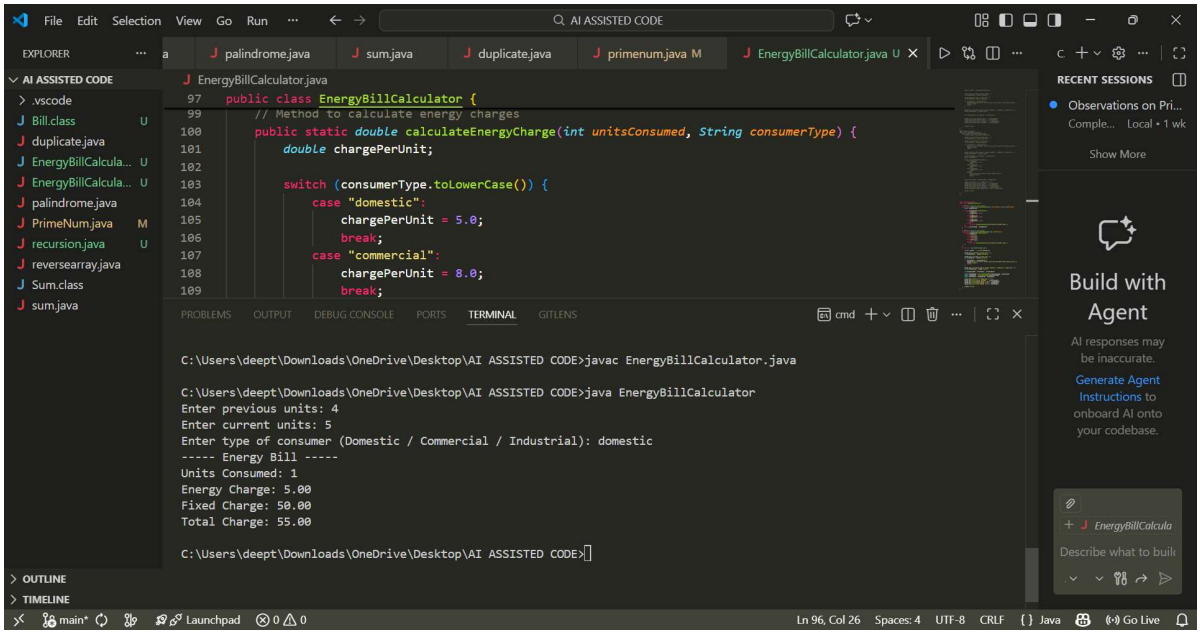
CODE :

```
import java.util.Scanner;
public class EnergyBillCalculator {

    // Method to calculate energy charges
    public static double calculateEnergyCharge(int unitsConsumed, String consumerType) {
        double chargePerUnit;

        switch (consumerType.toLowerCase()) {
```

```
        case "domestic":
            chargePerUnit = 5.0;
            break;
        case "commercial":
            chargePerUnit = 8.0;
            break;
        case "industrial":
            chargePerUnit = 10.0;
            break;
        default:
            throw new IllegalArgumentException("Invalid consumer type.");
    }
    return unitsConsumed * chargePerUnit;
}

// Method to calculate fixed charges
public static double calculateFixedCharge(String consumerType) {
    switch (consumerType.toLowerCase()) {
        case "domestic":
            return 50.0;
        case "commercial":
            return 100.0;
        case "industrial":
            return 150.0;
        default:
            throw new IllegalArgumentException("Invalid consumer type.");
    }
}

public static void main(String[] args) {

    Scanner scanner = new Scanner(System.in);

    System.out.print("Enter previous units: ");
    int previousUnits = scanner.nextInt();

    System.out.print("Enter current units: ");
    int currentUnits = scanner.nextInt();

    if (currentUnits <= previousUnits) {
        System.out.println("Error: Current units must be greater than previous units.");
        scanner.close();
        return;
    }

    System.out.print("Enter type of consumer (Domestic / Commercial / Industrial): ");
    String consumerType = scanner.next();

    int unitsConsumed = currentUnits - previousUnits;

    double energyCharge = calculateEnergyCharge(unitsConsumed, consumerType);
    double fixedCharge = calculateFixedCharge(consumerType);
```

```
        double totalCharge = energyCharge + fixedCharge;

        System.out.println("----- Energy Bill -----");
        System.out.println("Units Consumed: " + unitsConsumed);
        System.out.printf("Energy Charge: %.2f\n", energyCharge);
        System.out.printf("Fixed Charge: %.2f\n", fixedCharge);
        System.out.printf("Total Charge: %.2f\n", totalCharge);

        scanner.close();
    }
}
```

OUTPUT :



Analysis :

Task 3 introduces modular programming using user-defined methods.
Separate methods are used to calculate energy charges and fixed charges.
This makes the program reusable and easier to maintain.
Modular design improves code structure and readability.

TASK- 4

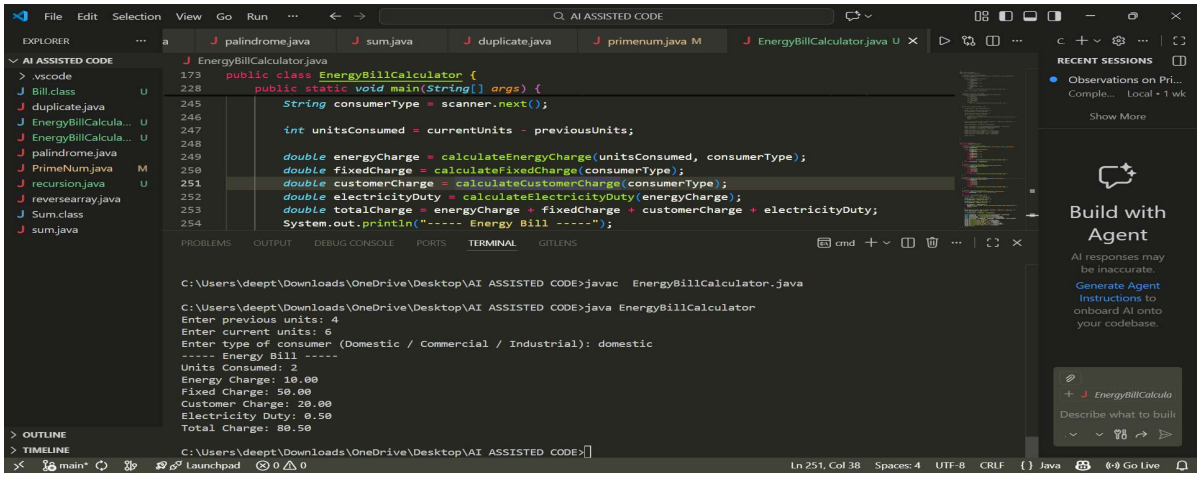
Prompt : *Write a Java* electricity billing program to calculate *Fixed* Charges, *Customer* Charges, and *Electricity* Duty (as a percentage of *Energy* Charges), print each charge separately, and improve billing accuracy with clear output.

CODE :

```
import java.util.Scanner;
public class EnergyBillCalculator {

    // Method to calculate energy charges
    public static double calculateEnergyCharge(int unitsConsumed, String consumerType) {
        double chargePerUnit;

        switch (consumerType.toLowerCase()) {
            case "domestic":
                chargePerUnit = 5.0;
                break;
            case "commercial":
                chargePerUnit = 8.0;
                break;
            case "industrial":
                chargePerUnit = 10.0;
                break;
            default:
                throw new IllegalArgumentException("Invalid consumer type.");
        }
        return unitsConsumed * chargePerUnit;
    }

    // Method to calculate fixed charges
    public static double calculateFixedCharge(String consumerType) {
        switch (consumerType.toLowerCase()) {
            case "domestic":
                return 50.0;
            case "commercial":
                return 100.0;
            case "industrial":
                return 150.0;
            default:
                throw new IllegalArgumentException("Invalid consumer type.");
        }
    }

    // Method to calculate customer charges
    public static double calculateCustomerCharge(String consumerType) {
        switch (consumerType.toLowerCase()) {
            case "domestic":
                return 20.0;
            case "commercial":
                return 40.0;
            case "industrial":
                return 60.0;
            default:
                throw new IllegalArgumentException("Invalid consumer type.");
        }
    }

    // Method to calculate electricity duty
```

```
    public static double calculateElectricityDuty(double energyCharge) {
        return energyCharge * 0.05; // 5% of energy charges
    }

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter previous units: ");
        int previousUnits = scanner.nextInt();

        System.out.print("Enter current units: ");
        int currentUnits = scanner.nextInt();

        if (currentUnits <= previousUnits) {
            System.out.println("Error: Current units must be greater than previous units.");
            scanner.close();
            return;
        }

        System.out.print("Enter type of consumer (Domestic / Commercial / Industrial): ");
        String consumerType = scanner.next();

        int unitsConsumed = currentUnits - previousUnits;

        double energyCharge = calculateEnergyCharge(unitsConsumed, consumerType);
        double fixedCharge = calculateFixedCharge(consumerType);
        double customerCharge = calculateCustomerCharge(consumerType);
        double electricityDuty = calculateElectricityDuty(energyCharge);
        double totalCharge = energyCharge + fixedCharge + customerCharge + electricityDuty;
        System.out.println("----- Energy Bill -----");
        System.out.println("Units Consumed: " + unitsConsumed);
        System.out.printf("Energy Charge: %.2f\n", energyCharge);
        System.out.printf("Fixed Charge: %.2f\n", fixedCharge);
        System.out.printf("Customer Charge: %.2f\n", customerCharge);
        System.out.printf("Electricity Duty: %.2f\n", electricityDuty);
        System.out.printf("Total Charge: %.2f\n", totalCharge);
        scanner.close();
    }
}
```

OUTPUT :



Analysis :

This task extends billing by adding additional charges like fixed charges, customer charges, and electricity duty.
Electricity duty is calculated as a percentage of energy charges.
Printing individual charges helps verify calculation accuracy.
This step makes the bill more realistic and detailed.

TASK – 5

Prompt :
Generate a *Java* electricity billing program that calculates total bill (EC + FC + CC + ED), displays a neatly formatted final bill with all charge components, and includes brief comments on accuracy, readability, and real-world applicability.

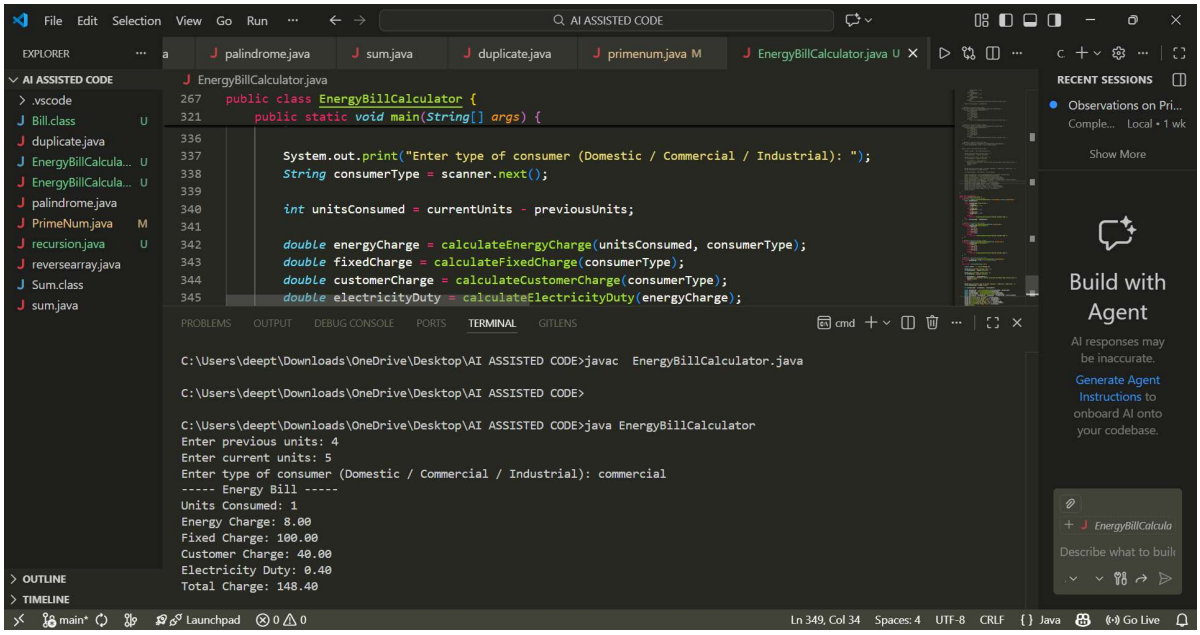
CODE :

```
import java.util.Scanner;
public class EnergyBillCalculator {
   // Method to calculate energy charges
   public static double calculateEnergyCharge(int unitsConsumed, String consumerType) {
      double chargePerUnit;

      switch (consumerType.toLowerCase()) {
         case "domestic":
            chargePerUnit = 5.0;
            break;
         case "commercial":
```

```
            chargePerUnit = 8.0;
            break;
        case "industrial":
            chargePerUnit = 10.0;
            break;
        default:
            throw new IllegalArgumentException("Invalid consumer type.");
    }
    return unitsConsumed * chargePerUnit;
}

// Method to calculate fixed charges
public static double calculateFixedCharge(String consumerType) {
    switch (consumerType.toLowerCase()) {
        case "domestic":
            return 50.0;
        case "commercial":
            return 100.0;
        case "industrial":
            return 150.0;
        default:
            throw new IllegalArgumentException("Invalid consumer type.");
    }
}

// Method to calculate customer charges
public static double calculateCustomerCharge(String consumerType) {
    switch (consumerType.toLowerCase()) {
        case "domestic":
            return 20.0;
        case "commercial":
            return 40.0;
        case "industrial":
            return 60.0;
        default:
            throw new IllegalArgumentException("Invalid consumer type.");
    }
}

// Method to calculate electricity duty
public static double calculateElectricityDuty(double energyCharge) {
    return energyCharge * 0.05; // 5% of energy charges
}

public static void main(String[] args) {

    Scanner scanner = new Scanner(System.in);

    System.out.print("Enter previous units: ");
    int previousUnits = scanner.nextInt();

    System.out.print("Enter current units: ");
```

```
    int currentUnits = scanner.nextInt();

    if (currentUnits <= previousUnits) {
        System.out.println("Error: Current units must be greater than previous units.");
        scanner.close();
        return;
    }

    System.out.print("Enter type of consumer (Domestic / Commercial / Industrial): ");
    String consumerType = scanner.next();

    int unitsConsumed = currentUnits - previousUnits;

    double energyCharge = calculateEnergyCharge(unitsConsumed, consumerType);
    double fixedCharge = calculateFixedCharge(consumerType);
    double customerCharge = calculateCustomerCharge(consumerType);
    double electricityDuty = calculateElectricityDuty(energyCharge);
    double totalCharge = energyCharge + fixedCharge + customerCharge + electricityDuty;
    System.out.println("----- Energy Bill -----");
    System.out.println("Units Consumed: " + unitsConsumed);
    System.out.printf("Energy Charge: %.2f\n", energyCharge);
    System.out.printf("Fixed Charge: %.2f\n", fixedCharge);
    System.out.printf("Customer Charge: %.2f\n", customerCharge);
    System.out.printf("Electricity Duty: %.2f\n", electricityDuty);
    System.out.printf("Total Charge: %.2f\n", totalCharge);
    scanner.close();
  }
```

OUTPUT :



Analysis :

Task 5 generates the final electricity bill by combining all charge components.
The total bill amount is calculated by adding EC, FC, CC, and ED.
The output is displayed in a neat, bill-like format for clarity.
This task demonstrates a complete, real-world electricity billing application.