A. Informasi & Ringkasan

1. Identitas

NIM	11S23043
Nama	Grace Evelin Siallagan
Kelas	12 IF 2
Judul Praktikum	Review PBO
Video Presentasi	https://youtu.be/crXRSRxuf1k?si=6T0rf75Xh1ue_w1u

2. Capaian & Ringkasan Pemahaman

Hasil Capaian setelah mengikuti praktikum:

- A (Penyelesaian): Selesai (1), Tidak Selesai (0).
- B (Pemahaman): Tidak Paham (1), Kurang Paham (2), Cukup Paham (3), Paham (4), Sangat Paham (5).

No	Indikator	A	B
1	Belajar Pemrograman Java	1	3
2	Studi Kasus 1: Matrix App	1	3

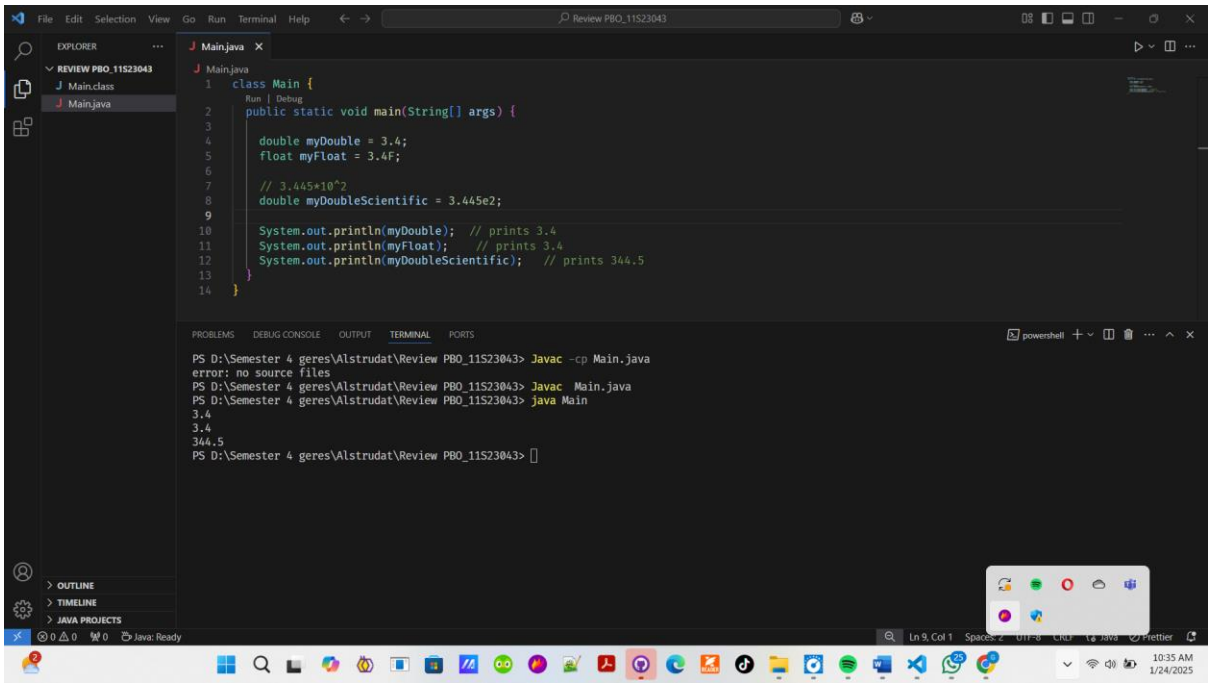
Dalam pemahaman saya, setelah mempelajari dan mempraktikkan praktikum ini, mahasiswa diharapkan mampu memahami kembali konsep pemrograman berorientasi objek (PBO) secara mendalam, khususnya dalam konteks pemrograman Java. Mahasiswa juga diharapkan dapat menerapkan prinsip-prinsip PBO seperti enkapsulasi, pewarisan, dan polimorfisme untuk menyelesaikan studi kasus nyata, seperti pengelolaan matriks yang mencakup operasi penjumlahan, pengurangan, dan perkalian. Praktikum ini melatih kemampuan teknis dalam coding, analisis logika, serta pengembangan program modular menggunakan file terpisah, sehingga mendukung pembelajaran yang lebih aplikatif dan relevan dengan kebutuhan industri pemrograman

B. Laporan Aktivitas Praktikum

1. Belajar Pemrograman Java

- **Java Fundamental**

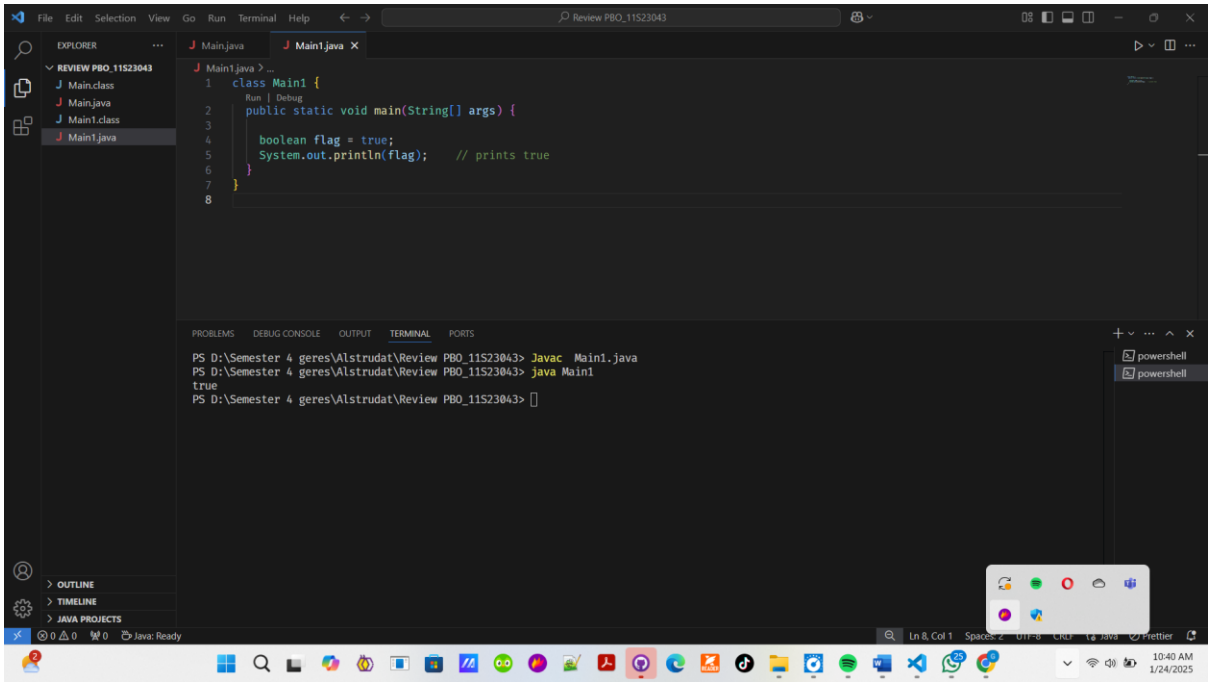
Floating-point Literals



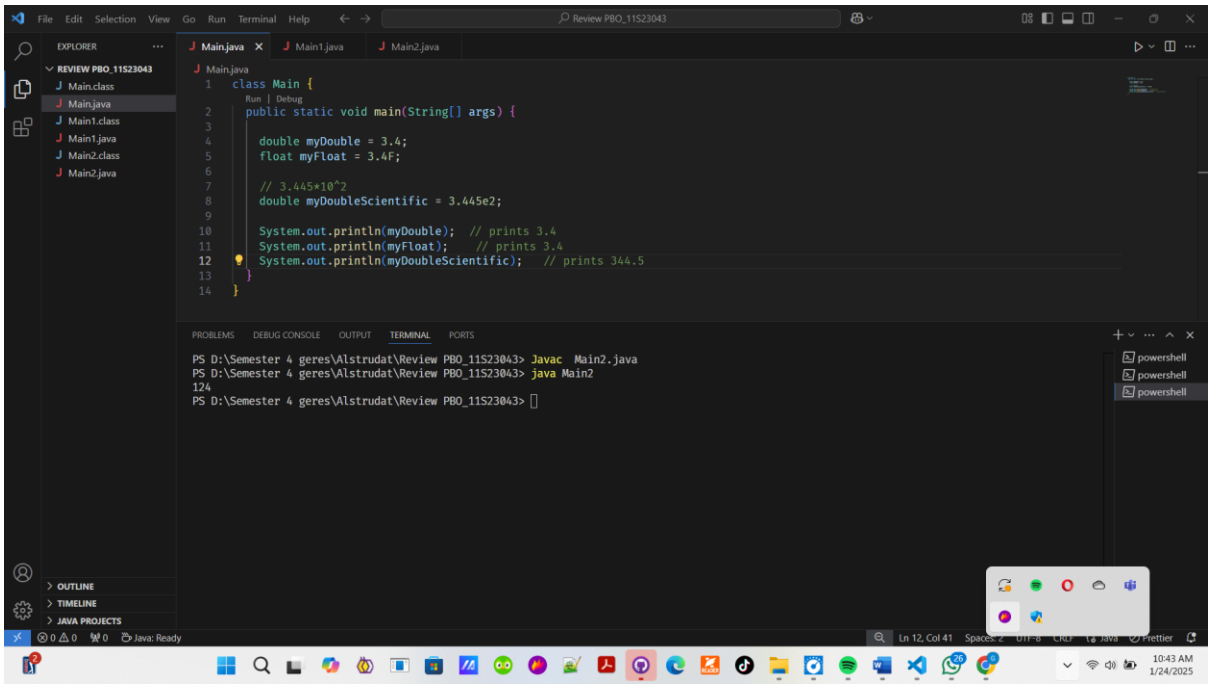
Kode tersebut mendeklarasikan tiga variabel untuk menyimpan bilangan desimal. Variabel myDouble bertipe double dengan nilai **3.4**, sementara myFloat bertipe float dengan nilai **3.4F**. Variabel myDoubleScientific menggunakan notasi ilmiah **3.445e2**, yang berarti **3.445 × 10²** atau **344.5**.

✓ **Java Data Types (Primitive)**

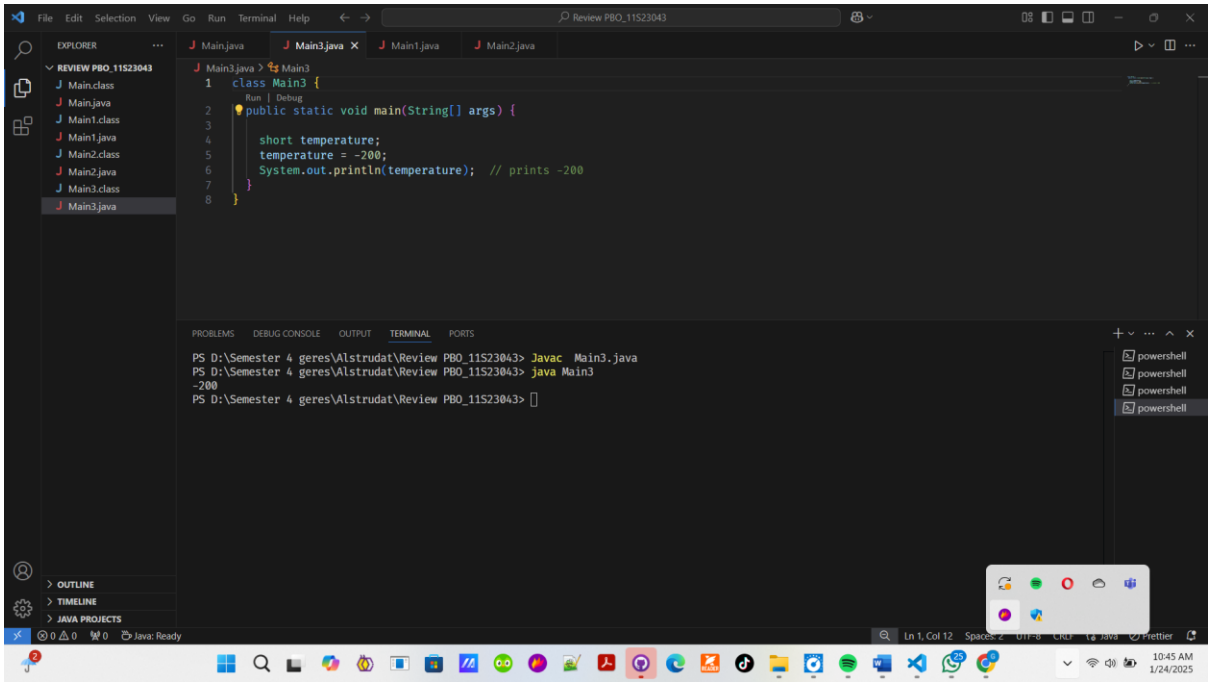
Java boolean data type



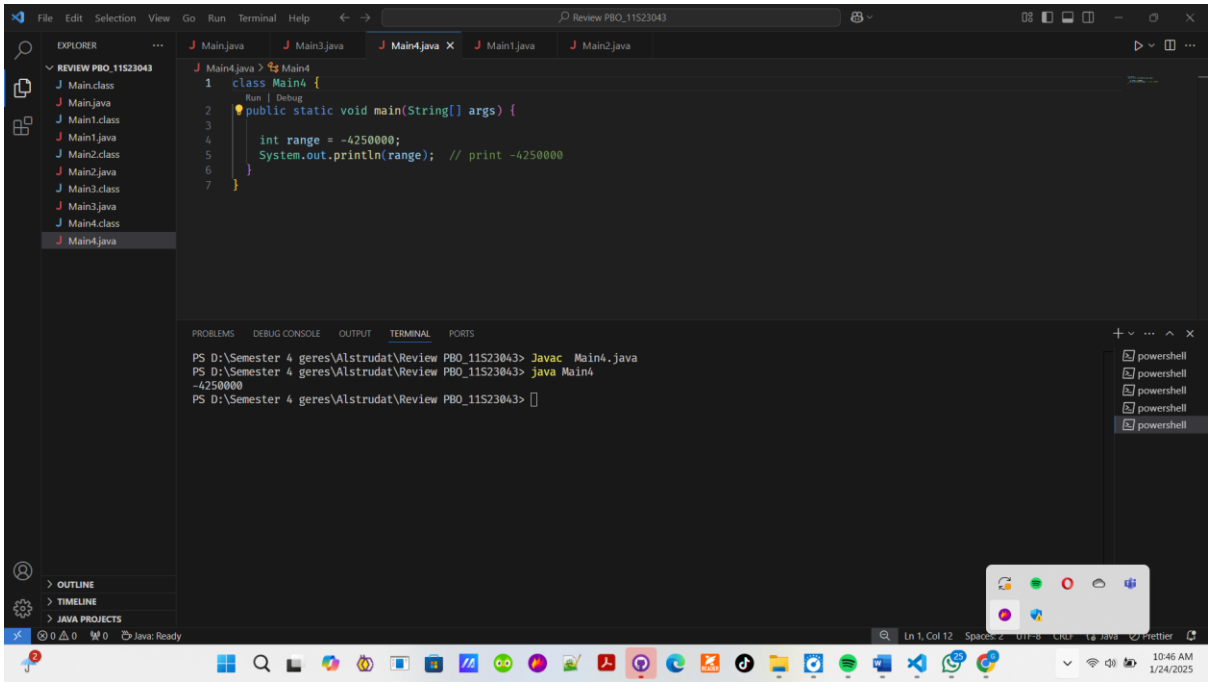
Java byte data type



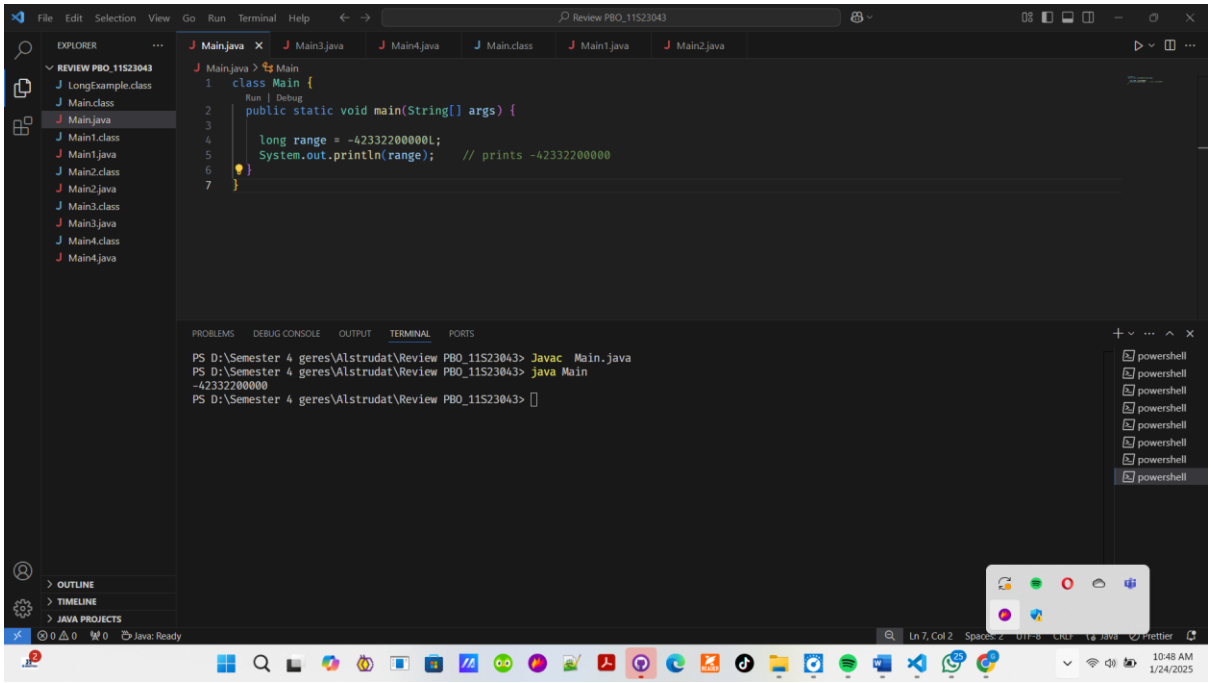
Java short data type



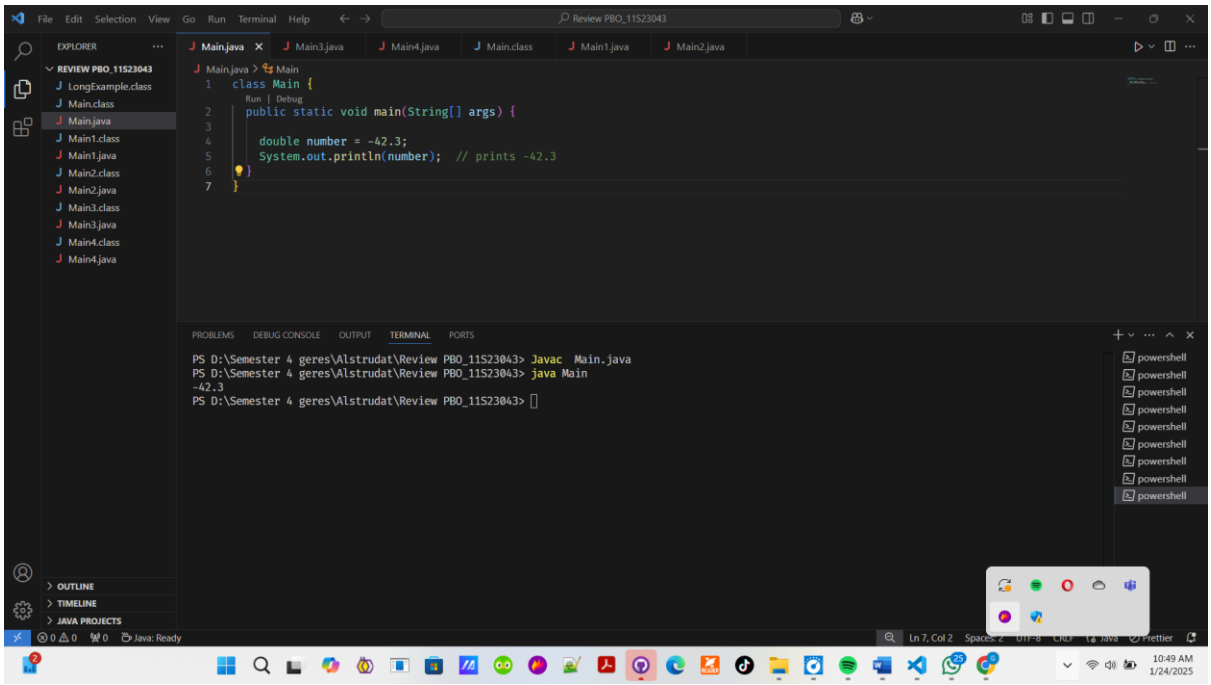
Java int data type



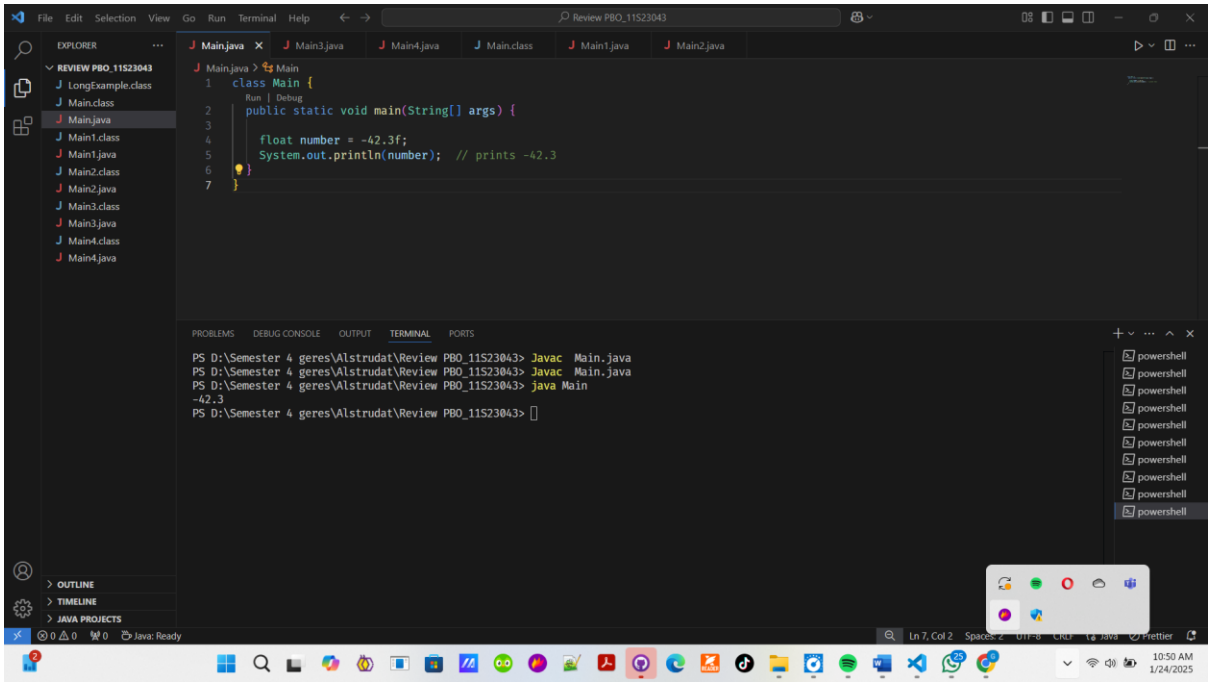
Java long data type



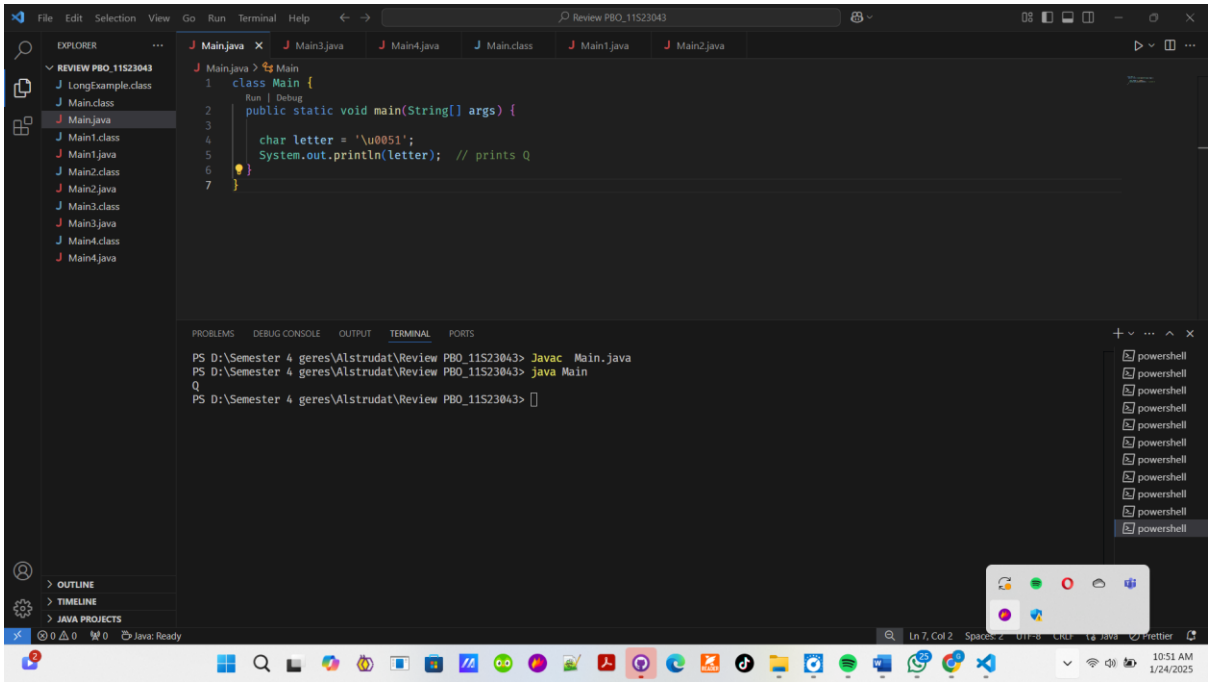
Java double data type



Java float data type

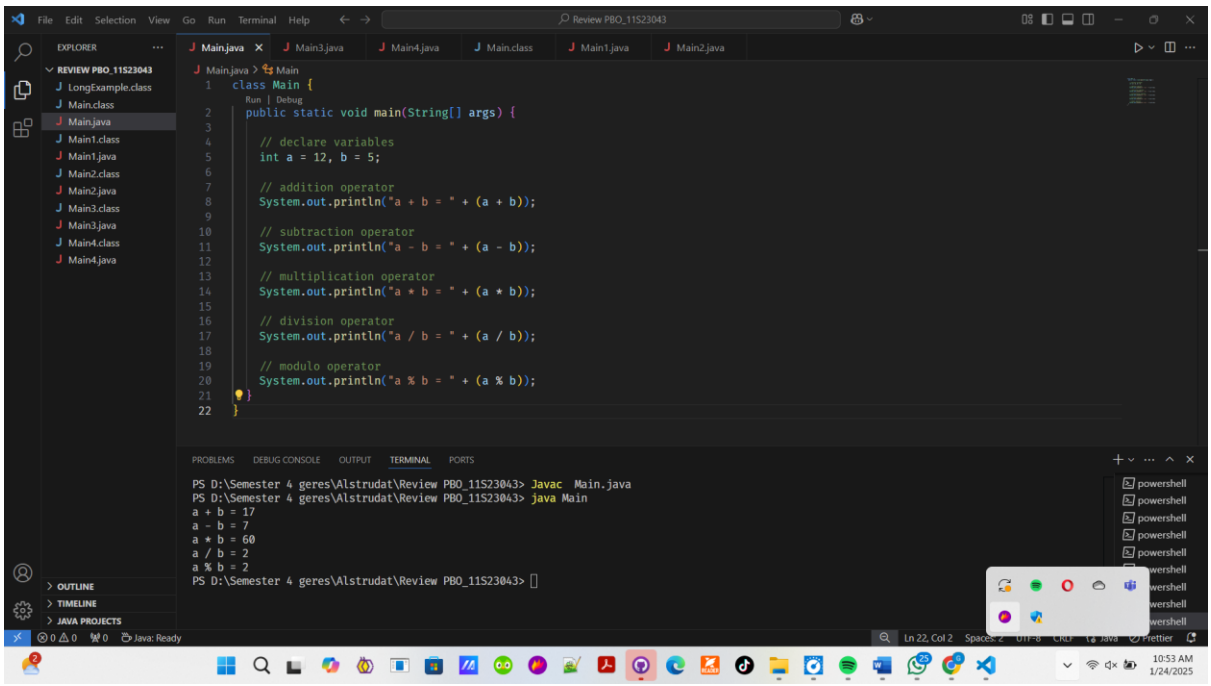

File Edit Selection View Go Run Terminal Help
Review PBO_11S23043
EXPLORER
REVIEW PBO_11S23043
LongExample.class
Main.class
Main.java
Main1.class
Main1.java
Main2.class
Main2.java
Main3.class
Main3.java
Main4.class
Main4.java
Main.java
Main3.java
Main4.java
Main.class
Main1.java
Main2.java
Main.java > Main
class Main {
Run | Debug
public static void main(String[] args) {
float number = -42.3f;
System.out.println(number); // prints -42.3
}
}
PROBLEMS
DEBUG CONSOLE
OUTPUT
TERMINAL
PORTS
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> Javac Main.java
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> Javac Main.java
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> java Main
-42.3
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043>
powershell
OUTLINE
TIMELINE
JAVA PROJECTS
Java: Ready
Ln 7, Col 2
10:50 AM
1/24/2025

Java char data type

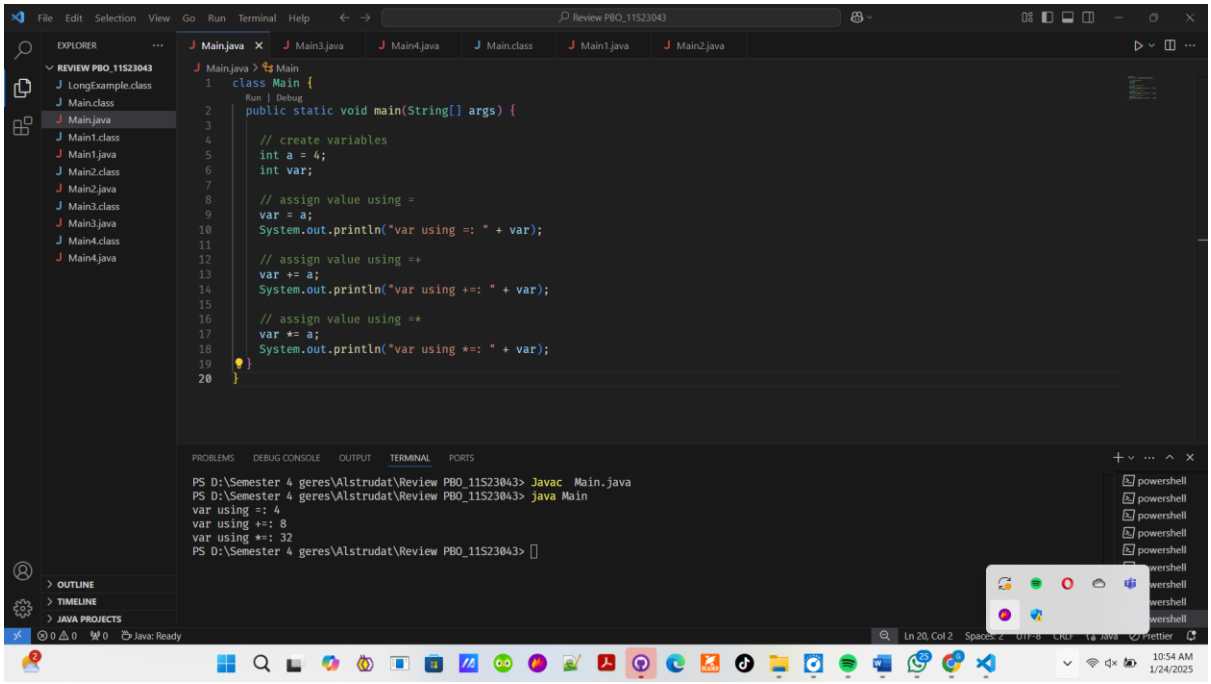


✓ Java Operators

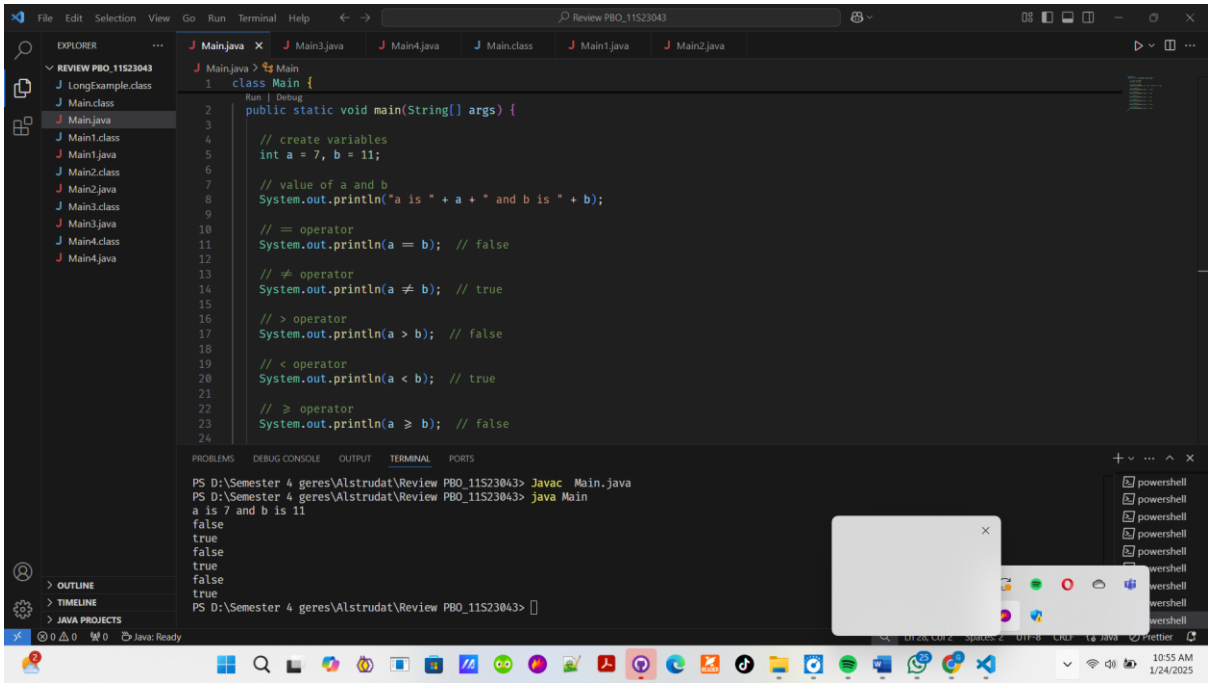
Arithmetic Operators



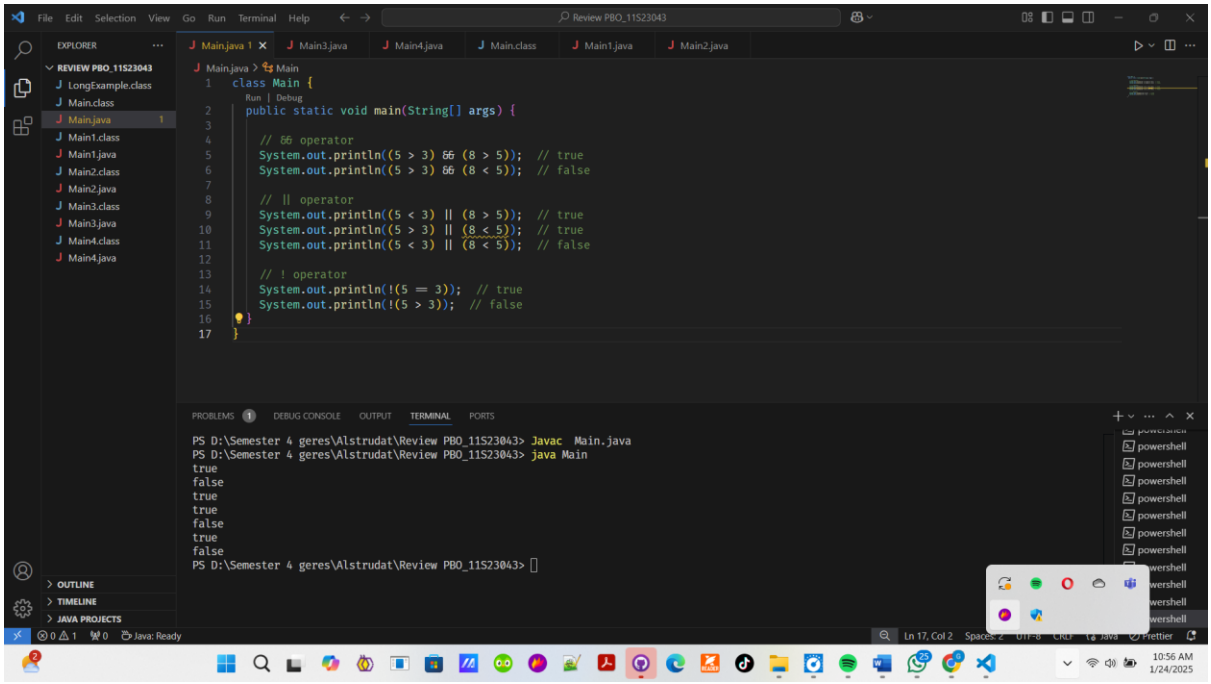
Assignment Operators



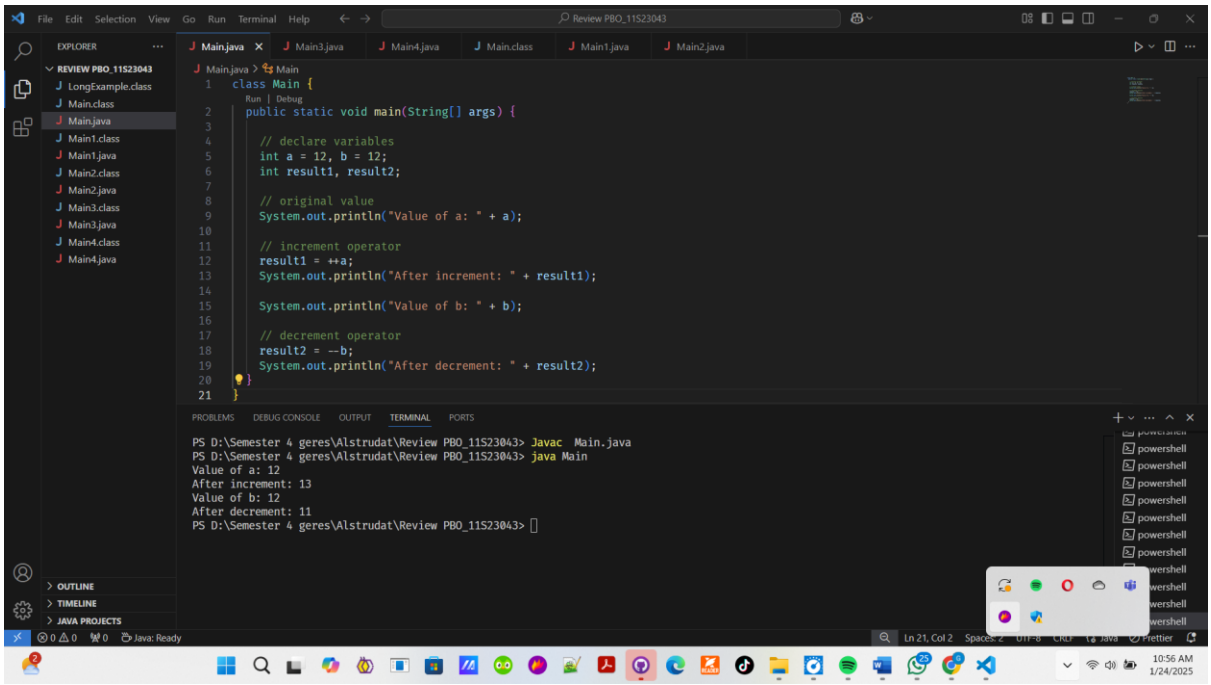
Relational Operators



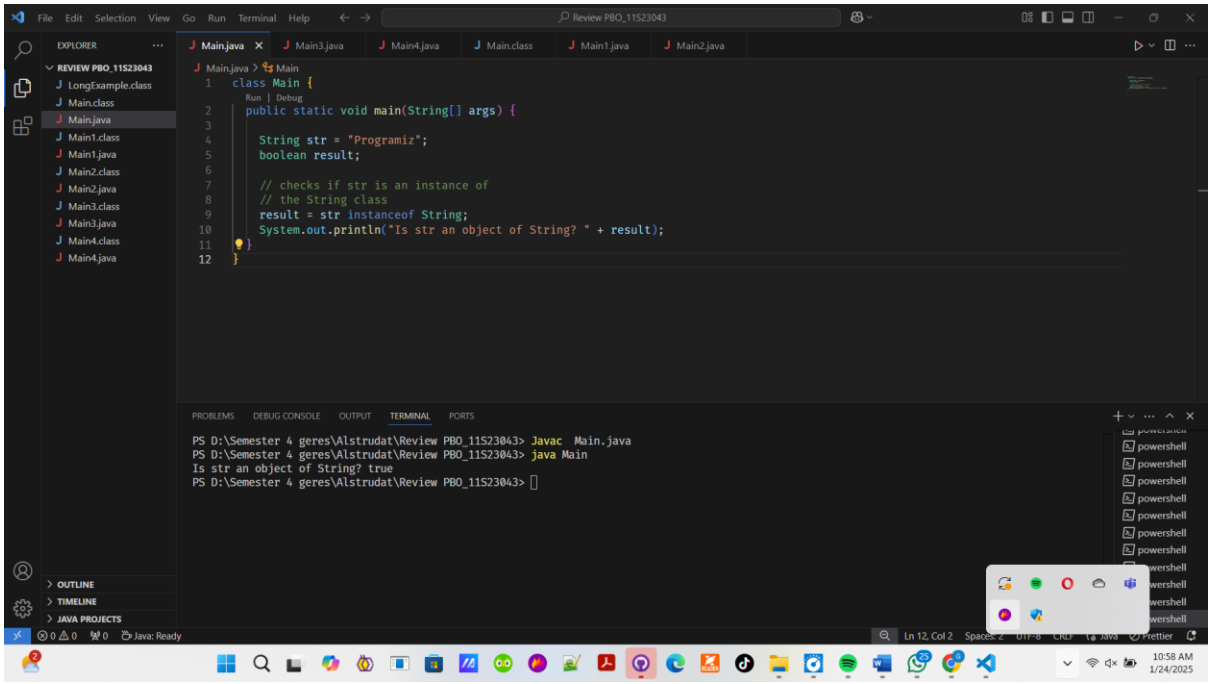
Logical Operators



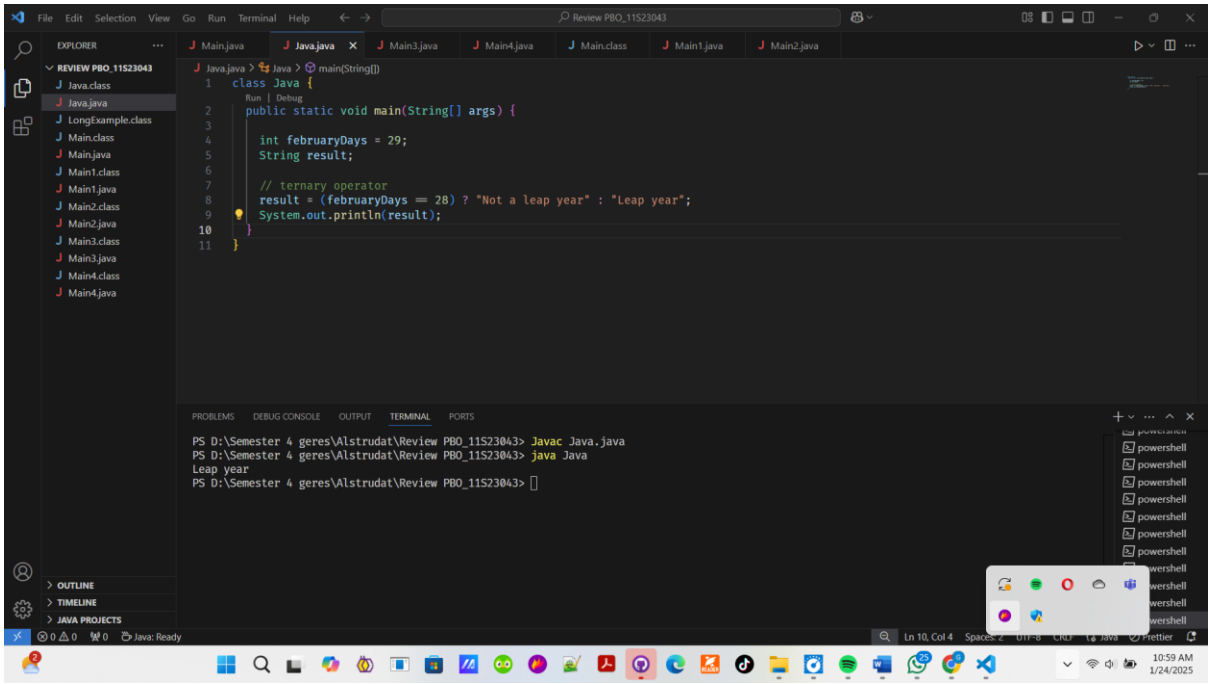
Increment and Decrement Operators



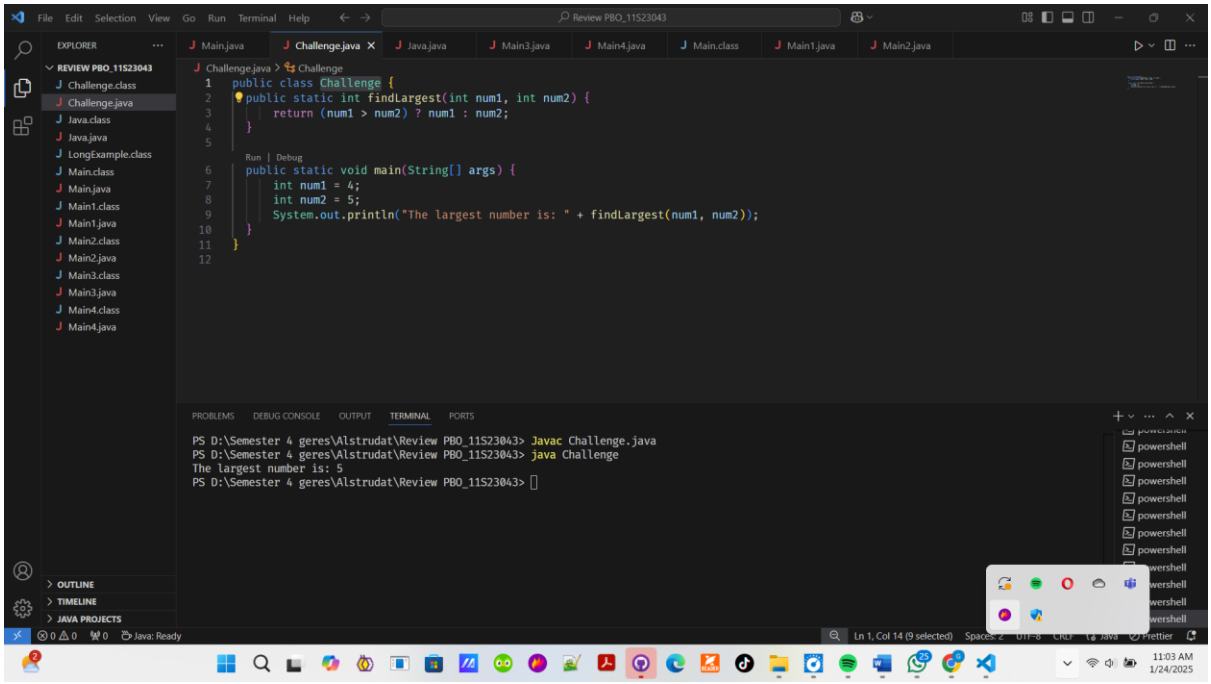
Java instanceof Operator



Java Ternary Operator

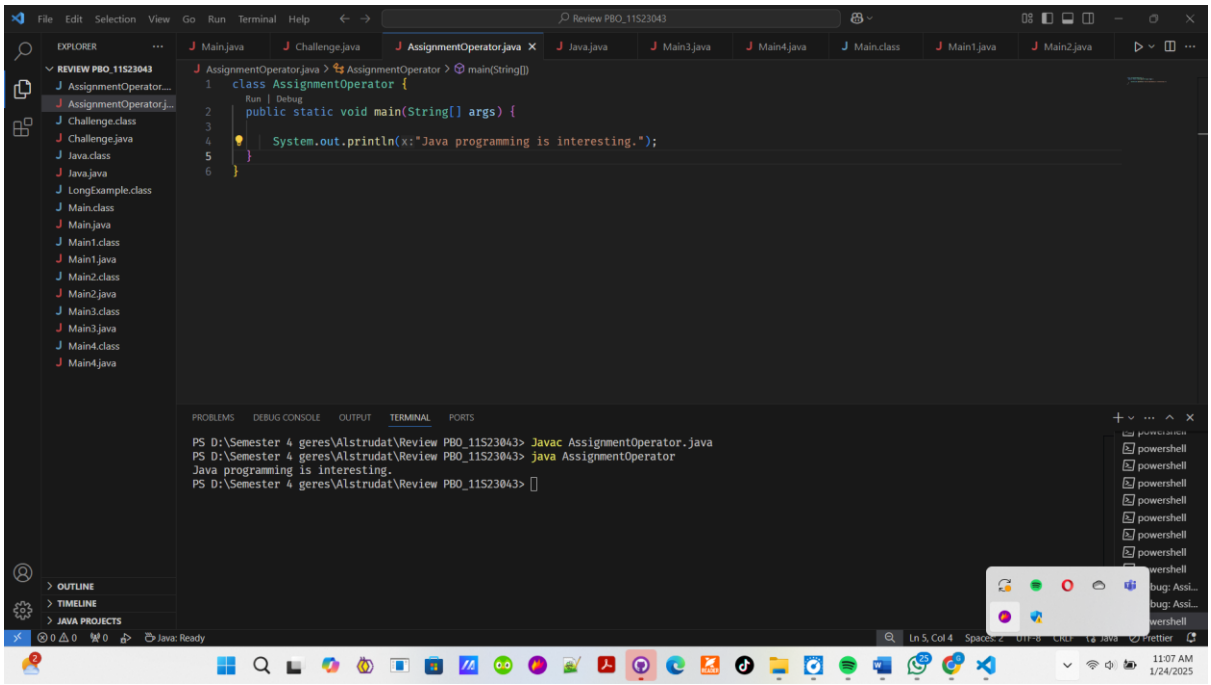


Challenge

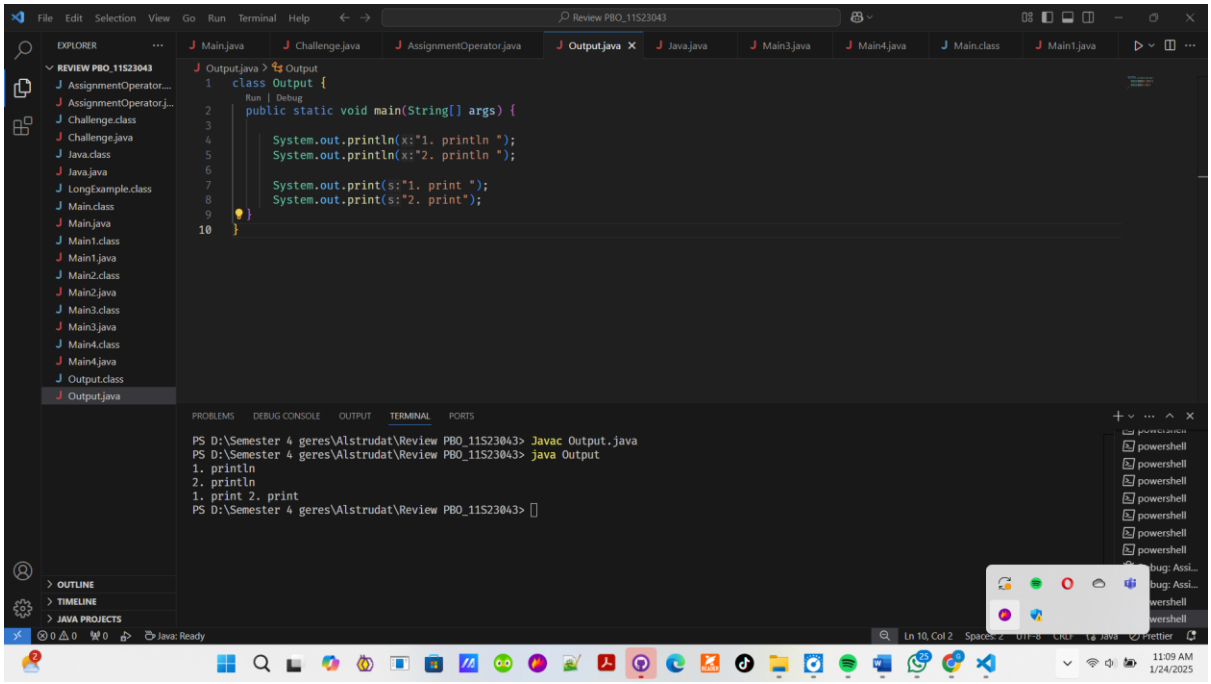


✓ Java Basic Input and Output

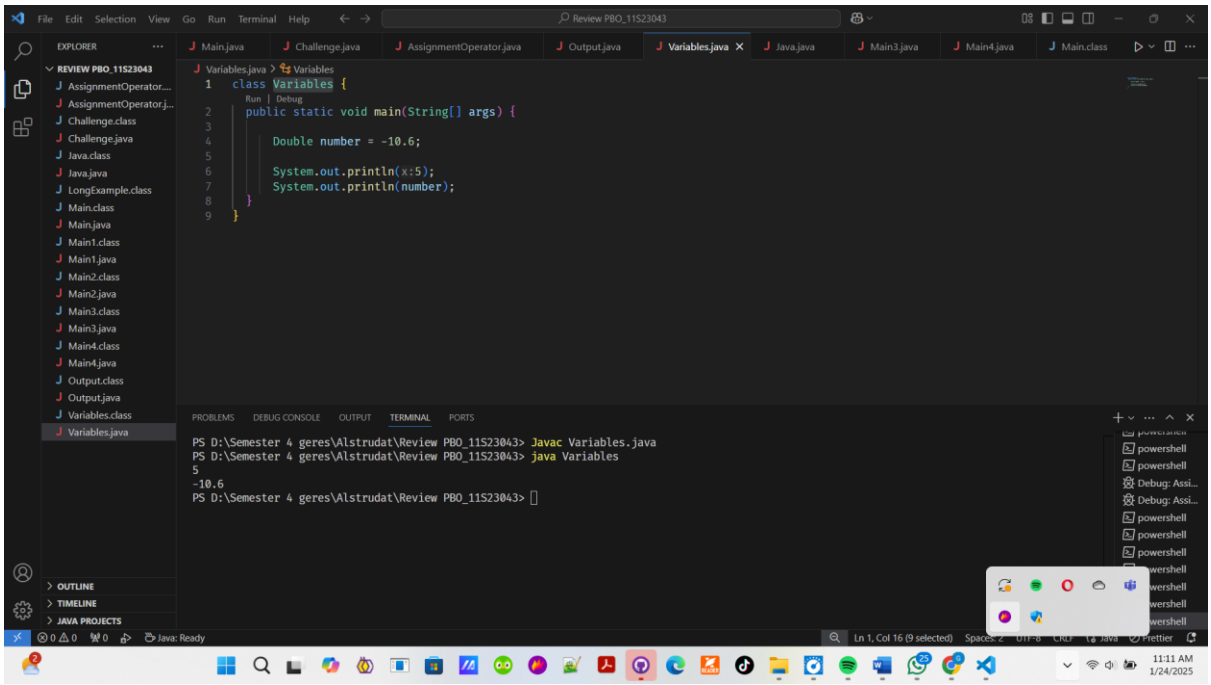
Java Output



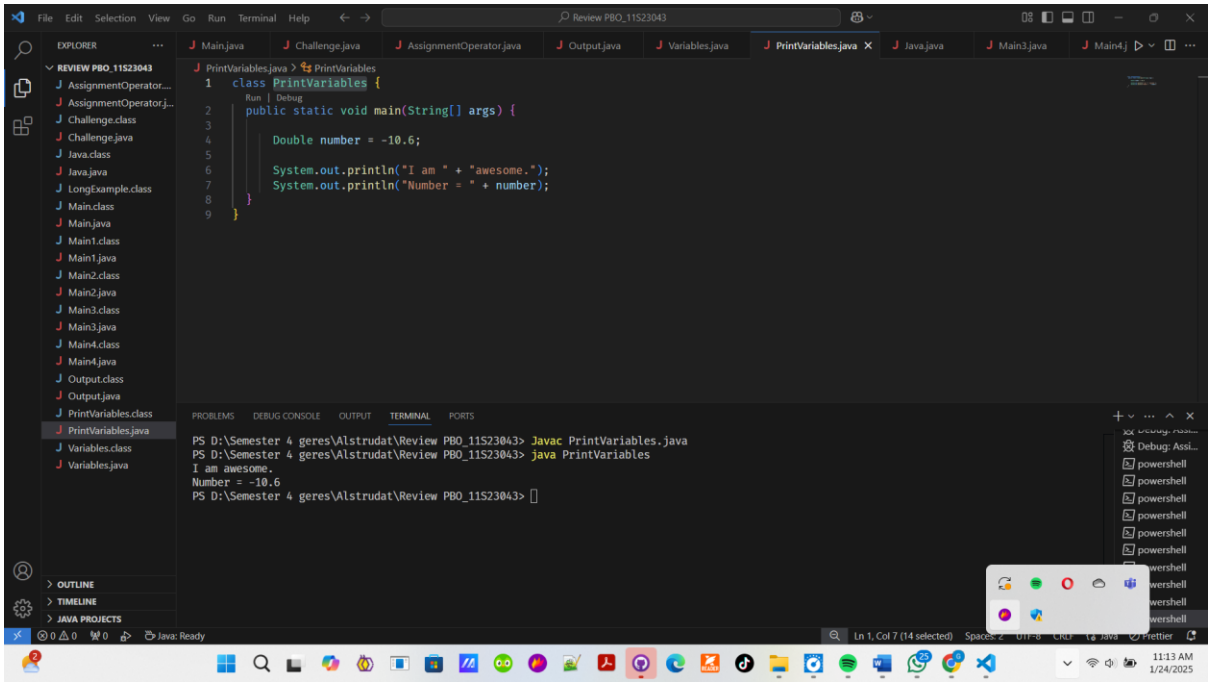
`print() and println()`



`Printing Variables and Literals`

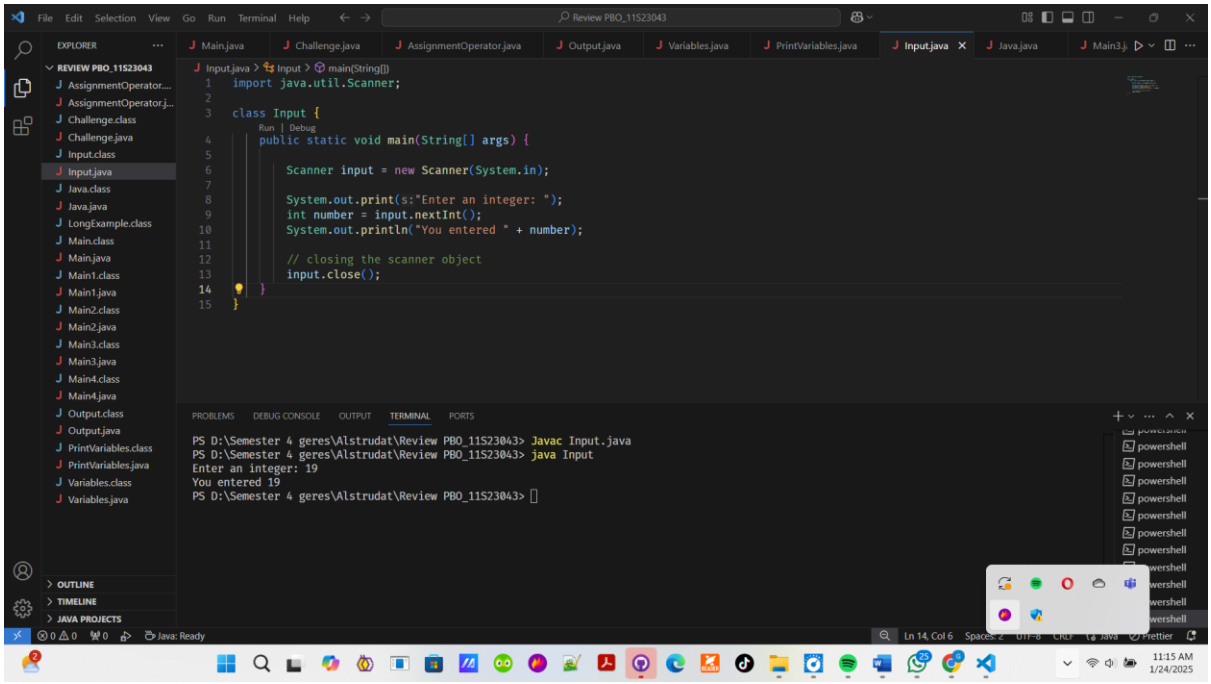


Print Concatenated Strings

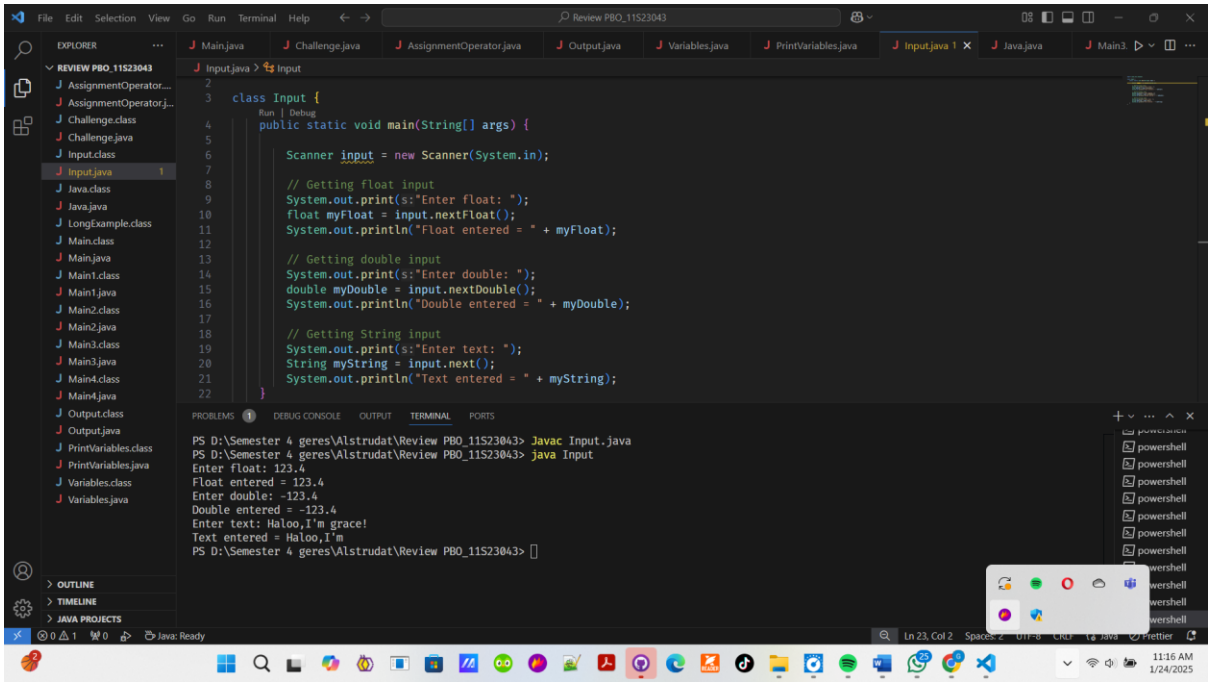


Java Input

Get Integer Input From the User

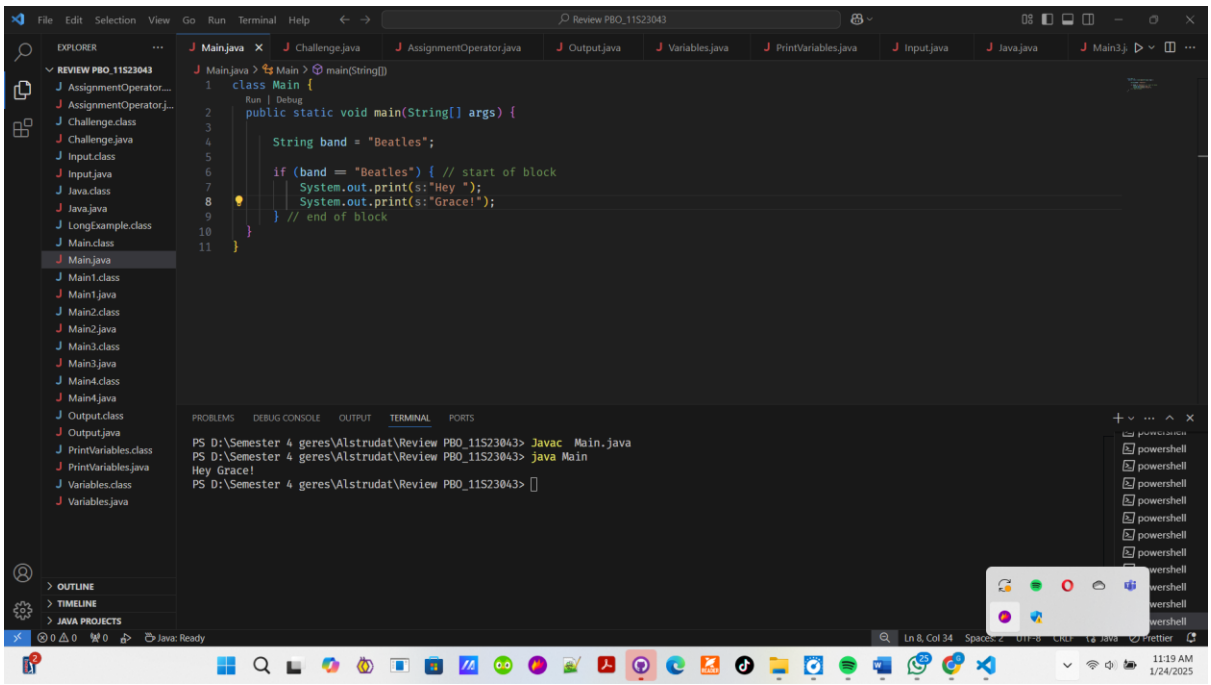


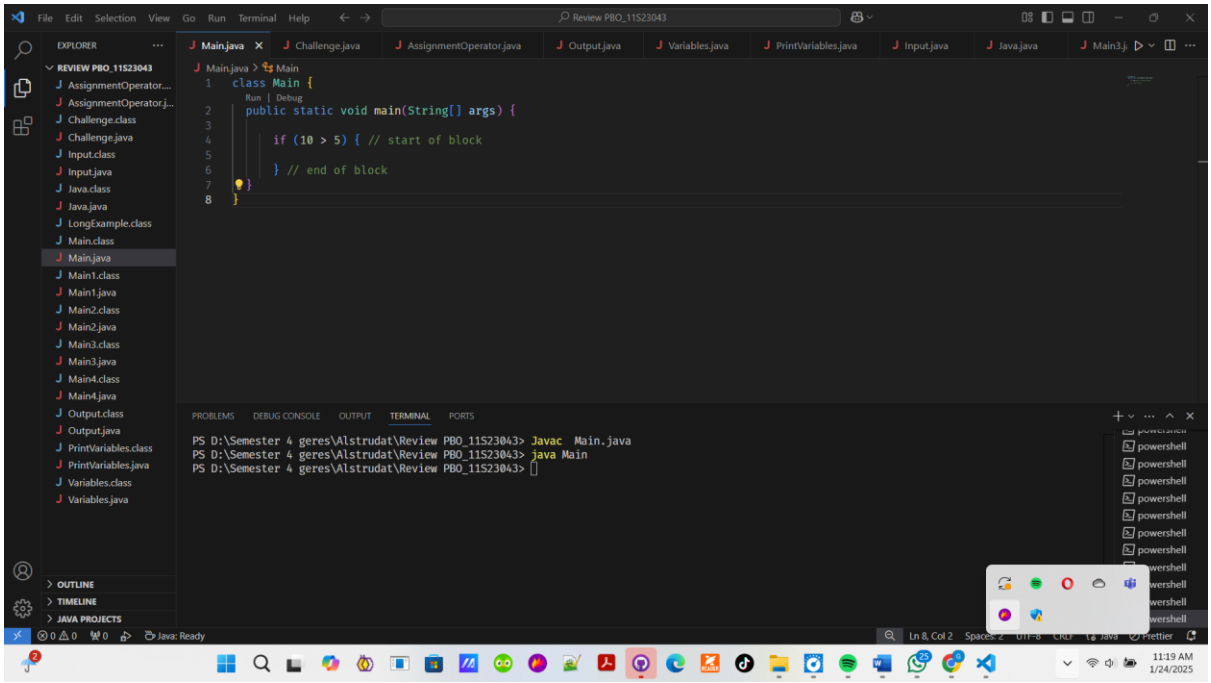
Get float, double and String Input



✓ Java Expressions, Statements and Blocks

Java Blocks

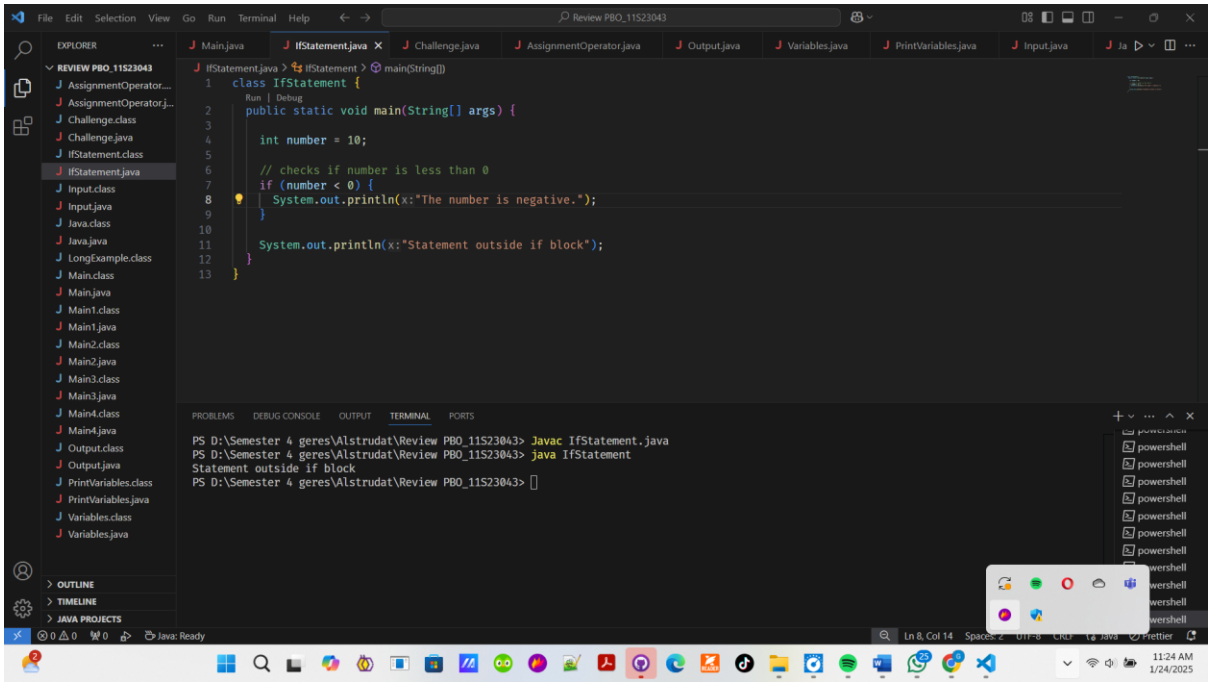




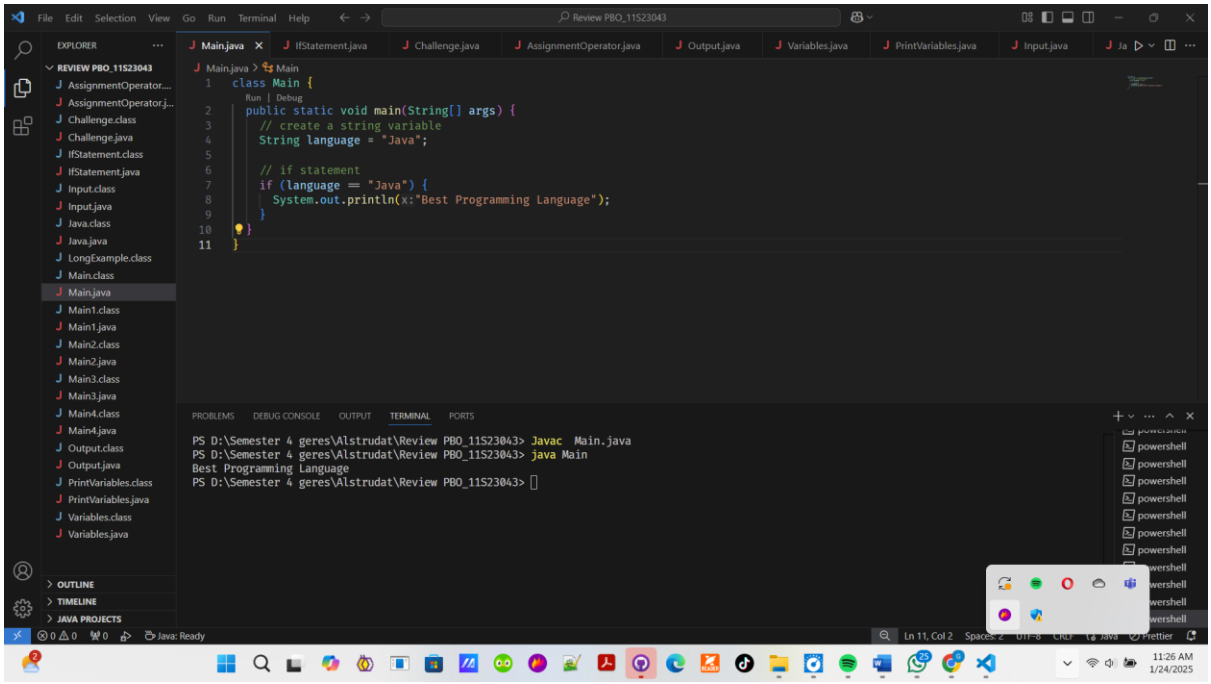
- **Java Flow Control**

✓ **Java if (if-then) Statement**

Java if Statement

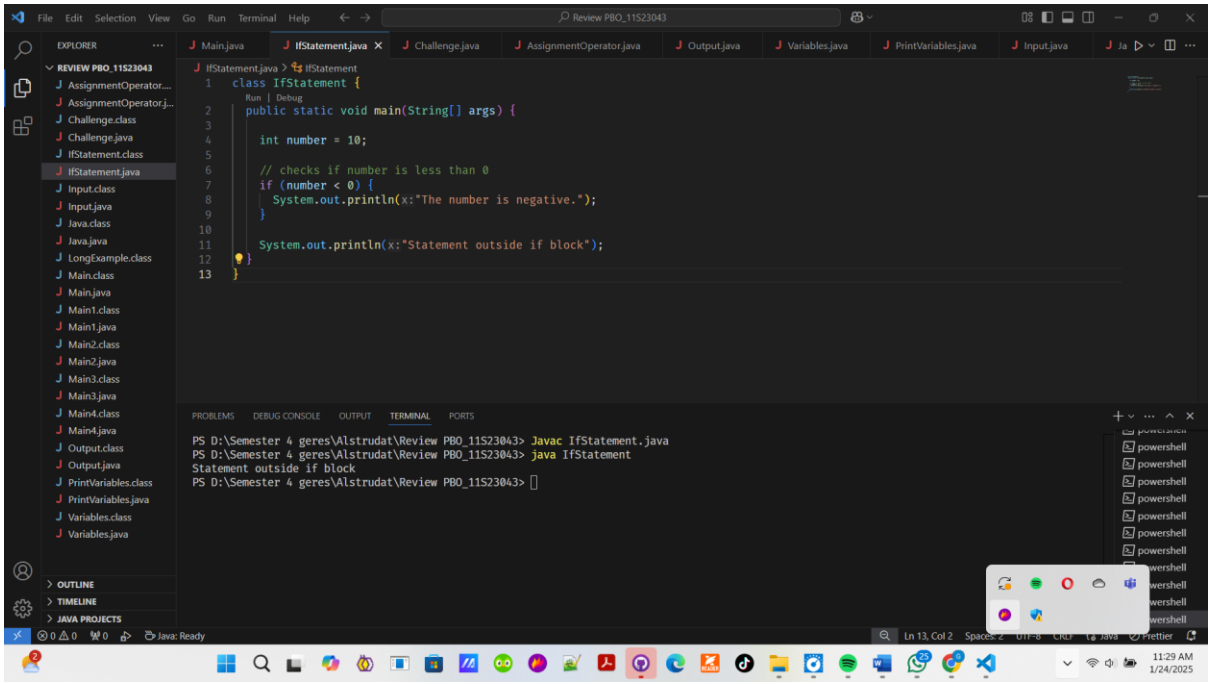


Java if with String

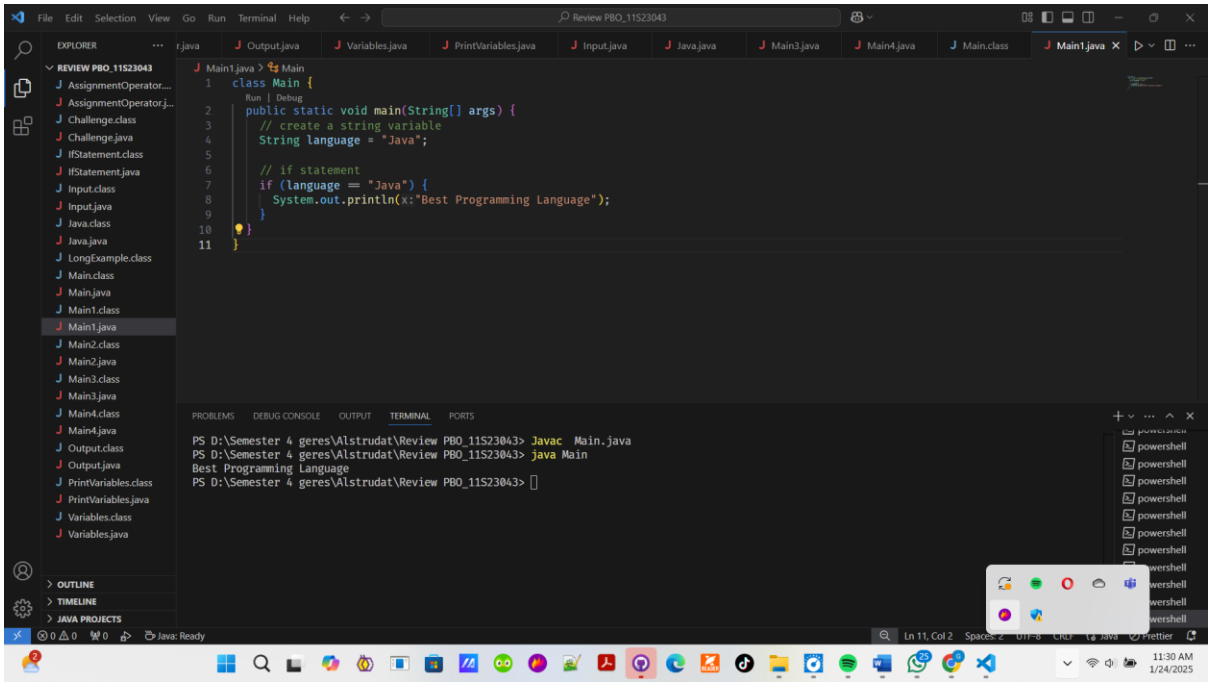


Java if...else (if-then-else) Statement

Java if Statement

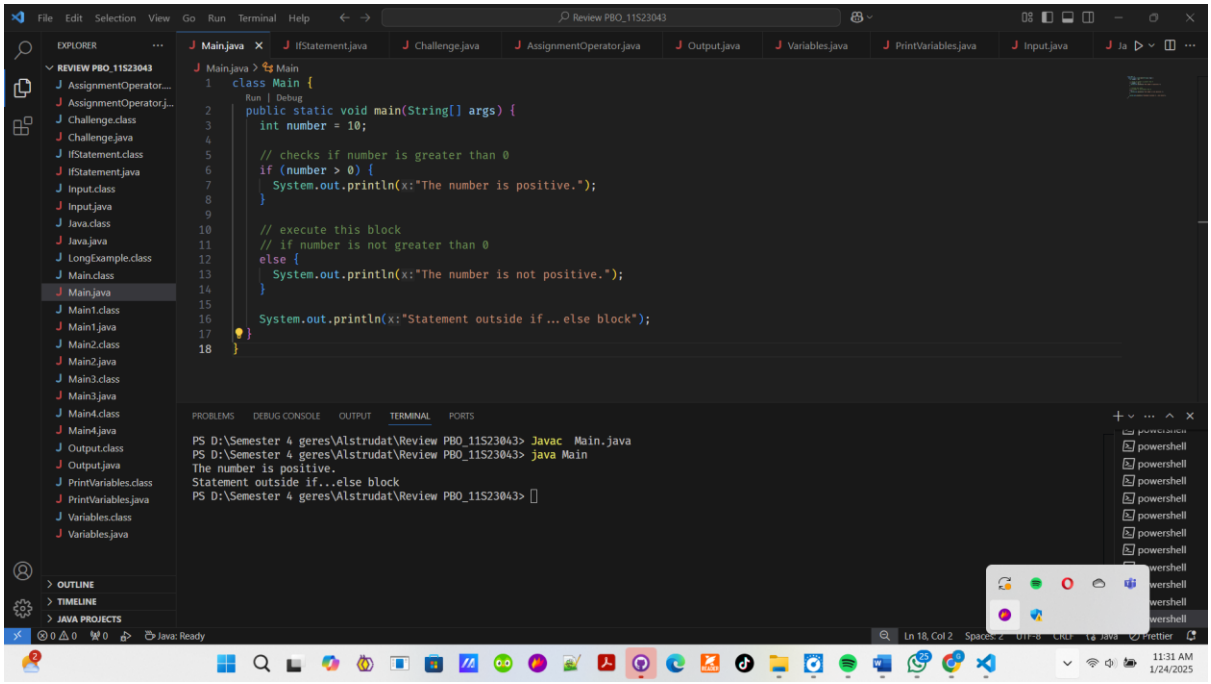


Java if with String

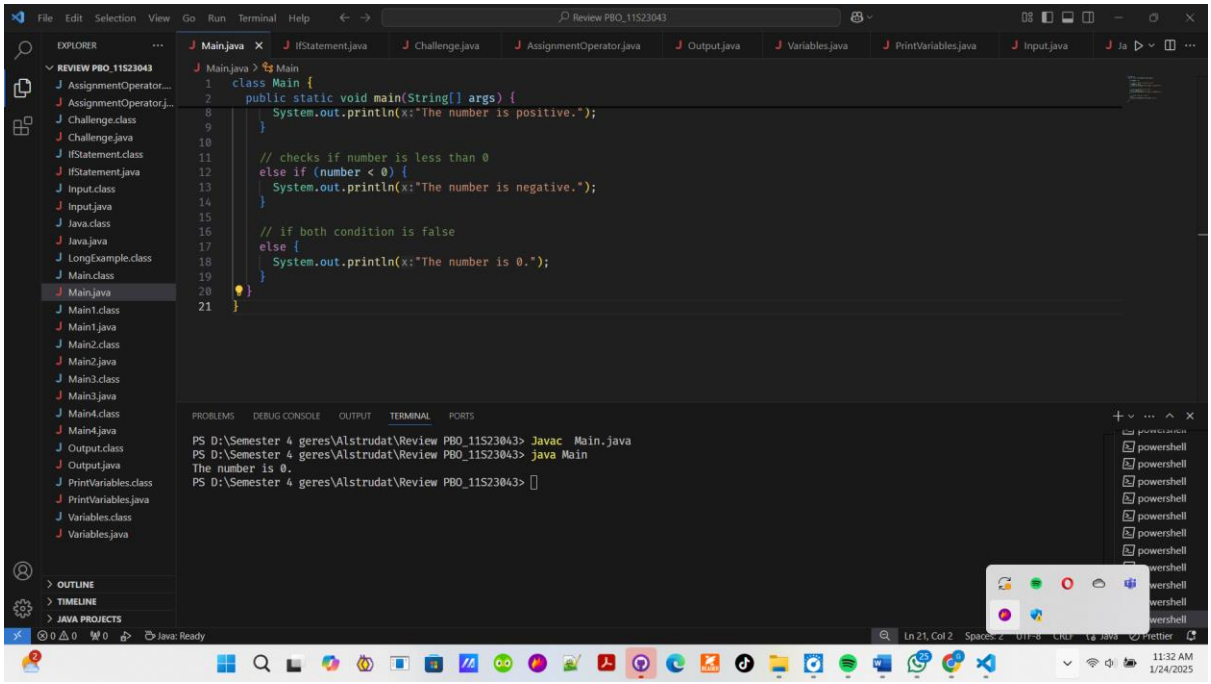


Java if...else (if-then-else) Statement

Java if...else Statement

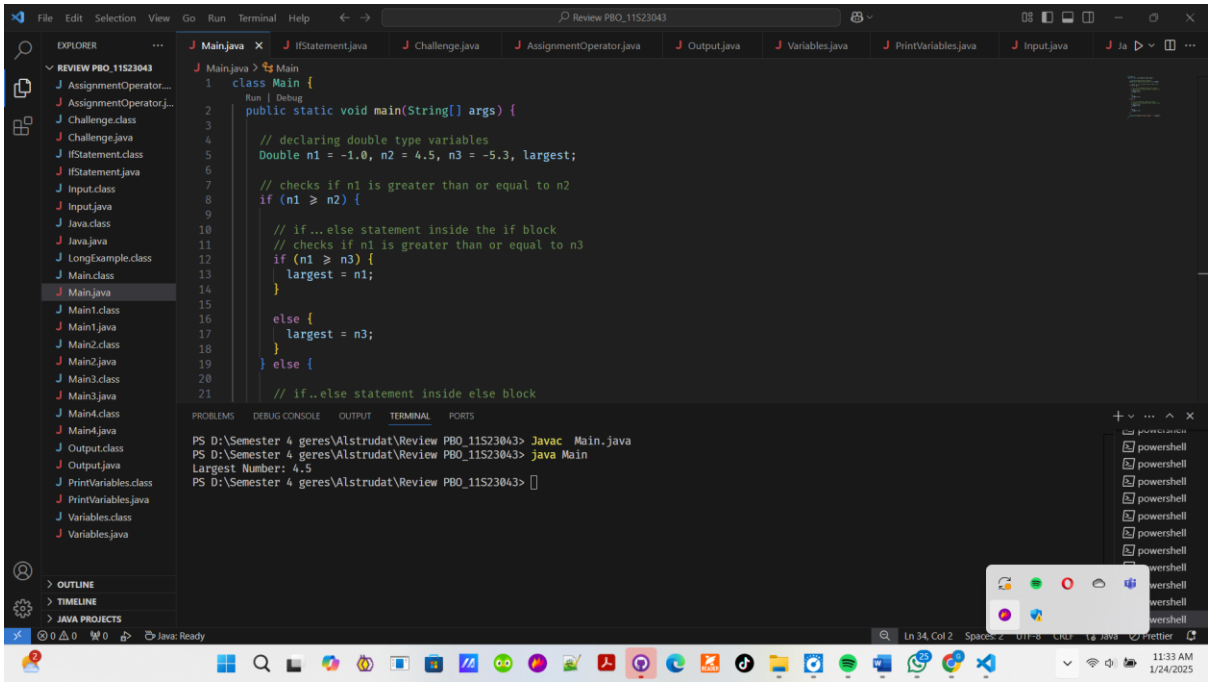


Java if...else...if Statement

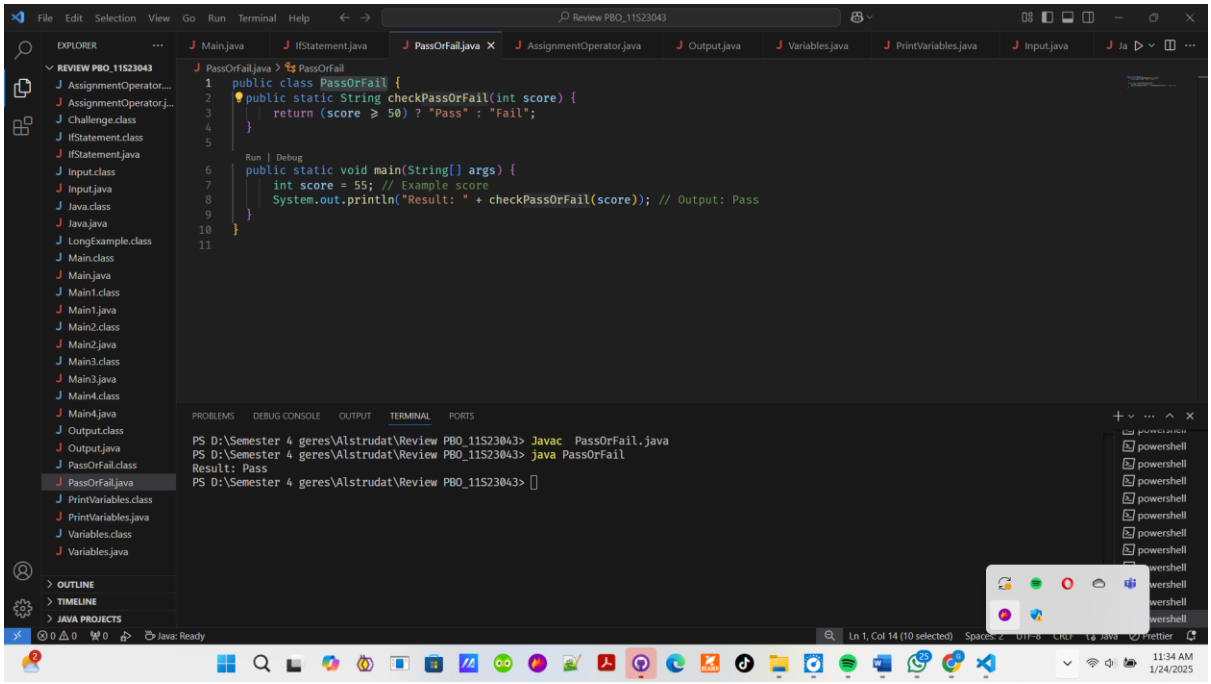


Java Nested if..else Statement

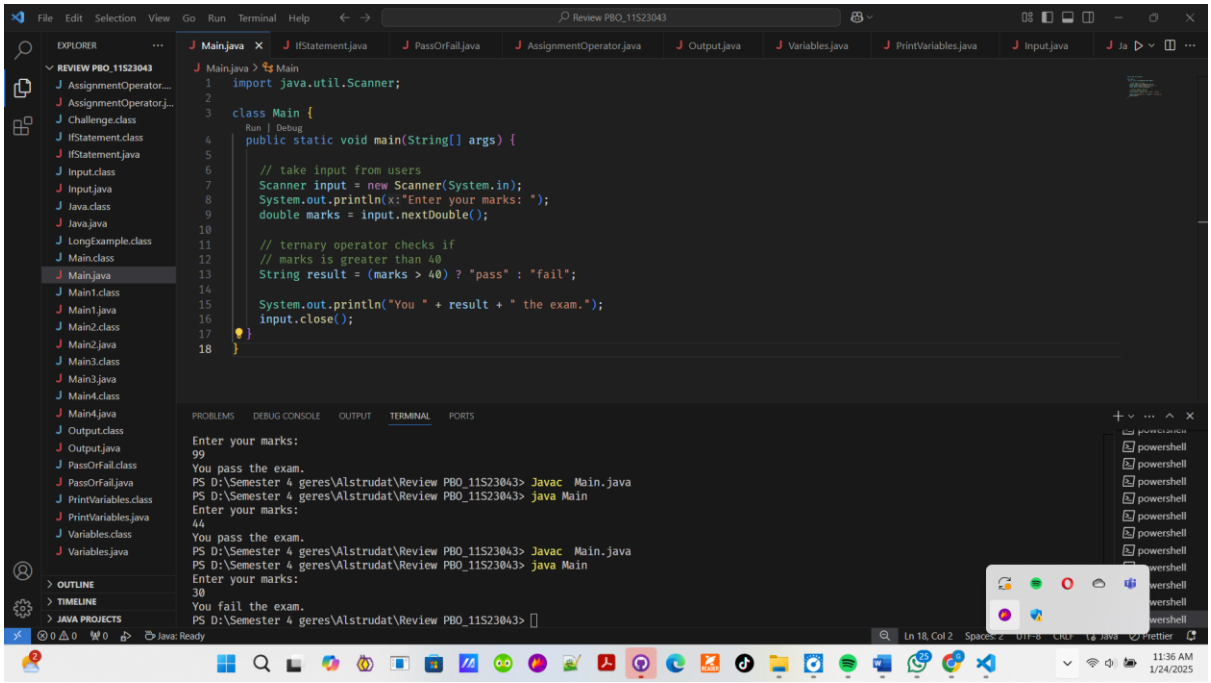
Nested if...else Statement

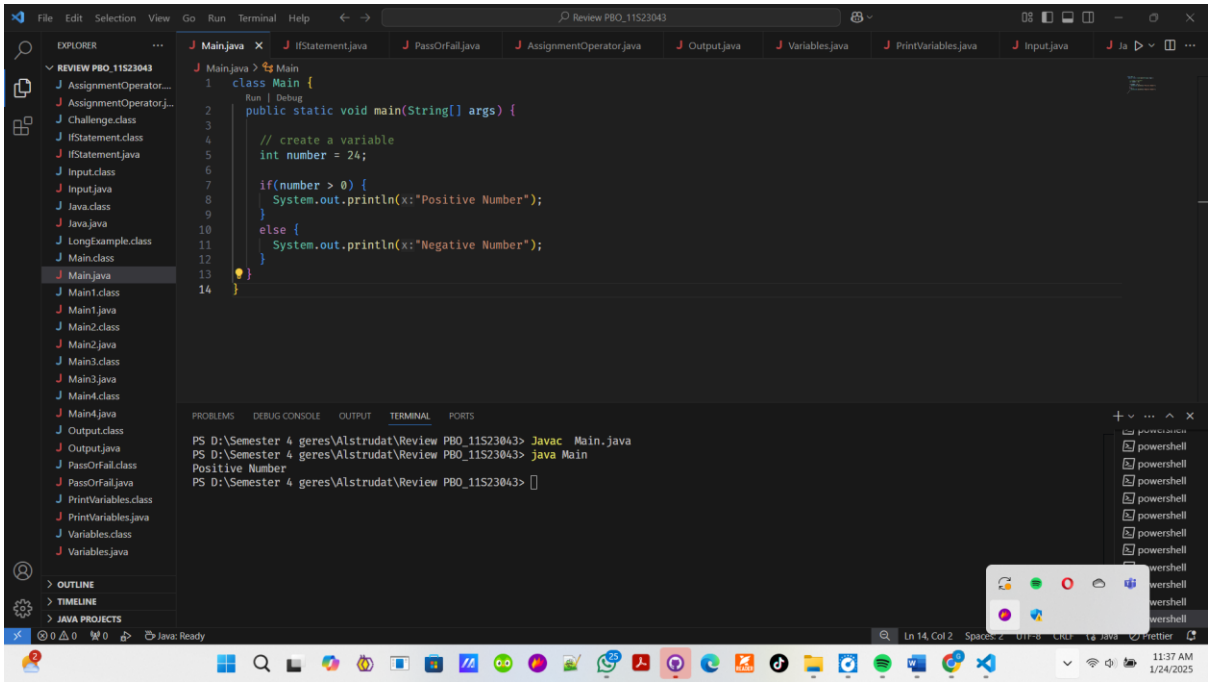


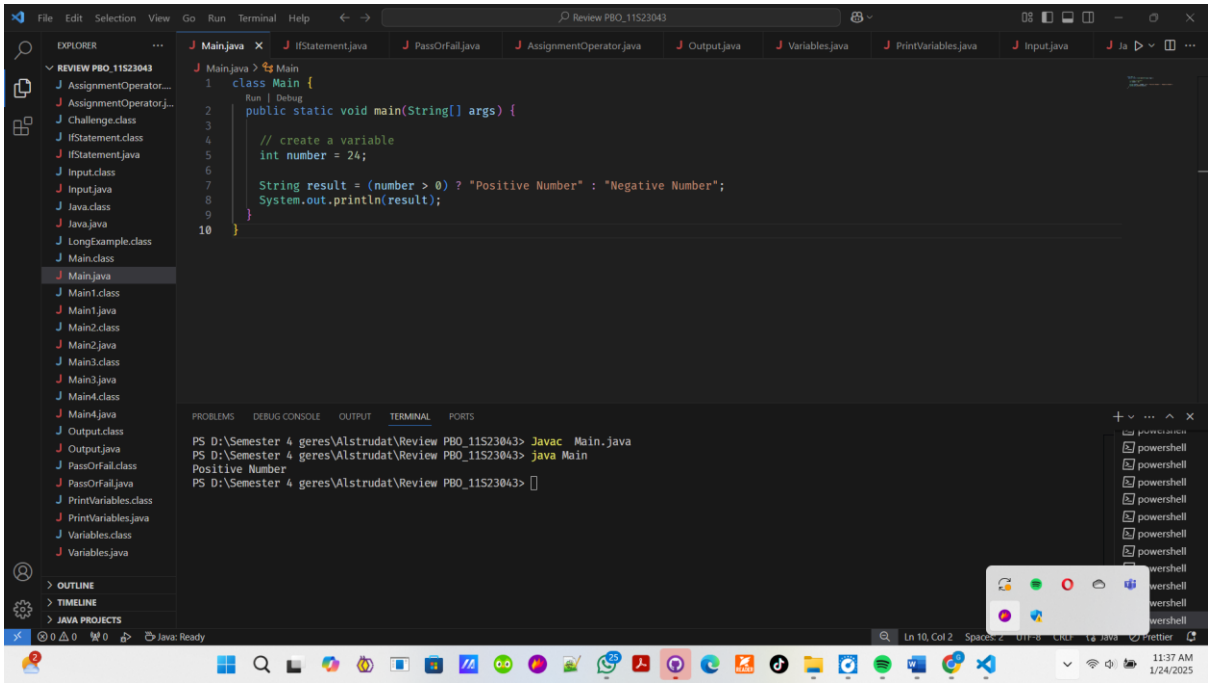
Challenge



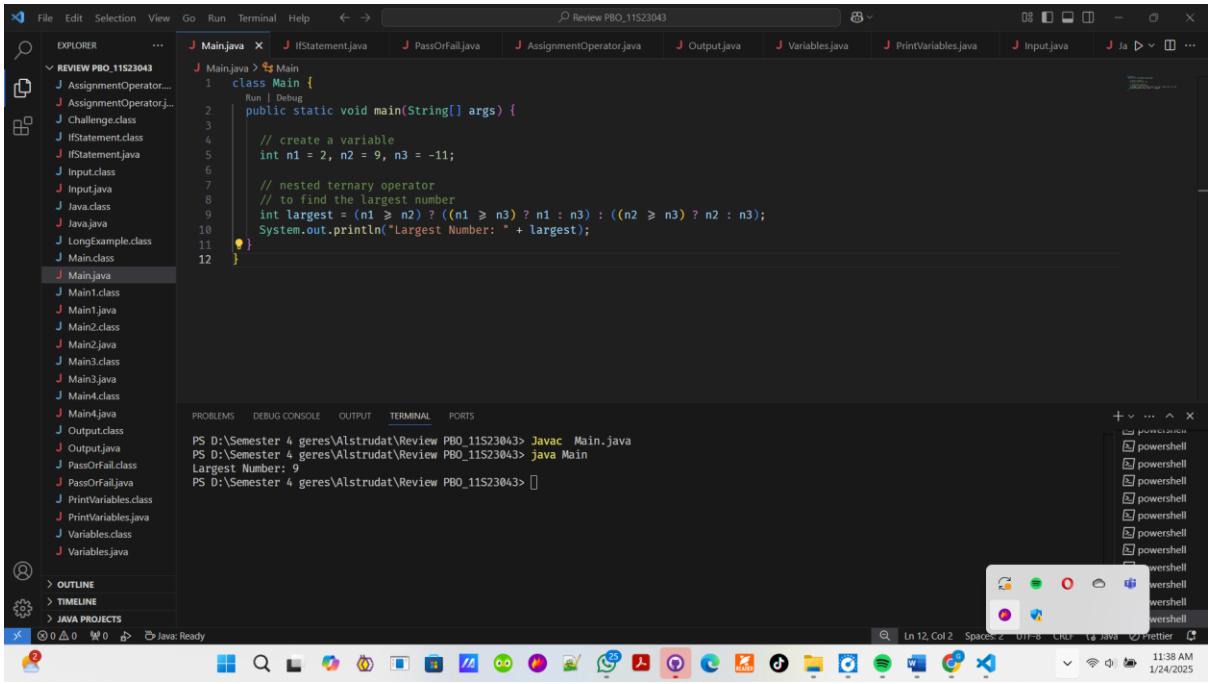
✓ Java Ternary Operator



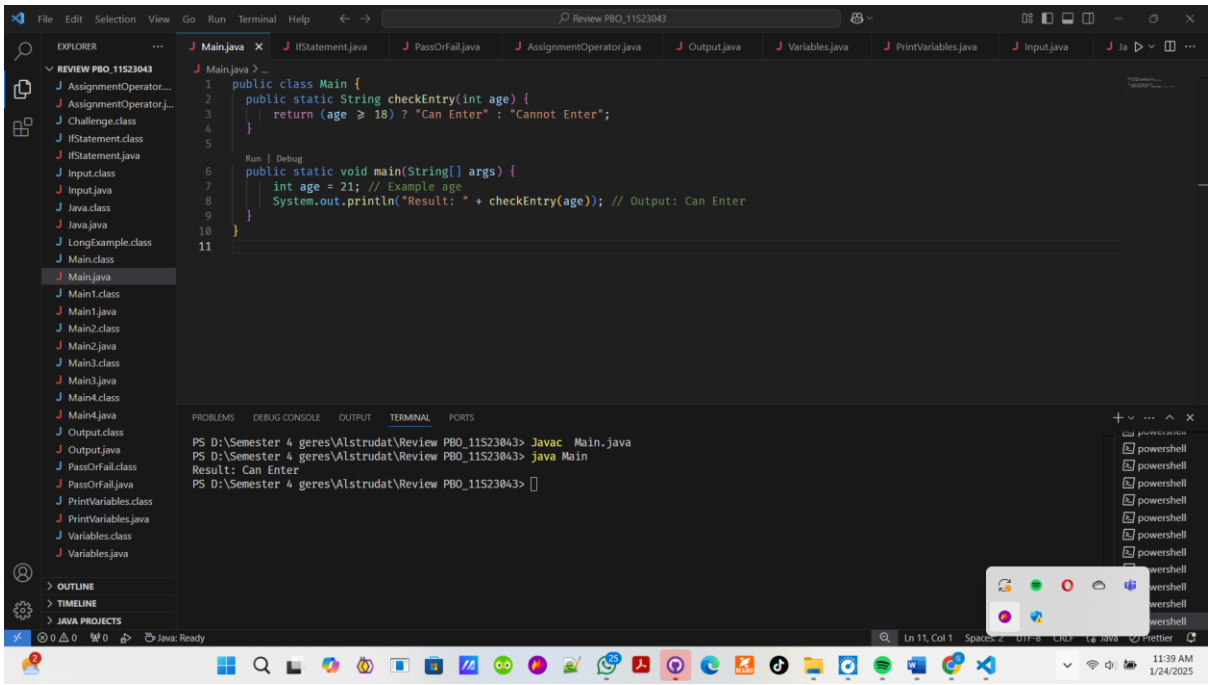

class Main {
public static void main(String[] args) {
// create a variable
int number = 24;
if(number > 0) {
System.out.println(x:"Positive Number");
}
else {
System.out.println(x:"Negative Number");
}
}
}
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> Javac Main.java
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> java Main
Positive Number
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043>


class Main {
public static void main(String[] args) {
// create a variable
int number = 24;
String result = (number > 0) ? "Positive Number" : "Negative Number";
System.out.println(result);
}
}
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> Javac Main.java
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043> java Main
Positive Number
PS D:\Semester 4 geres\Alstrudat\Review PBO_11S23043>

Nested Ternary Operators

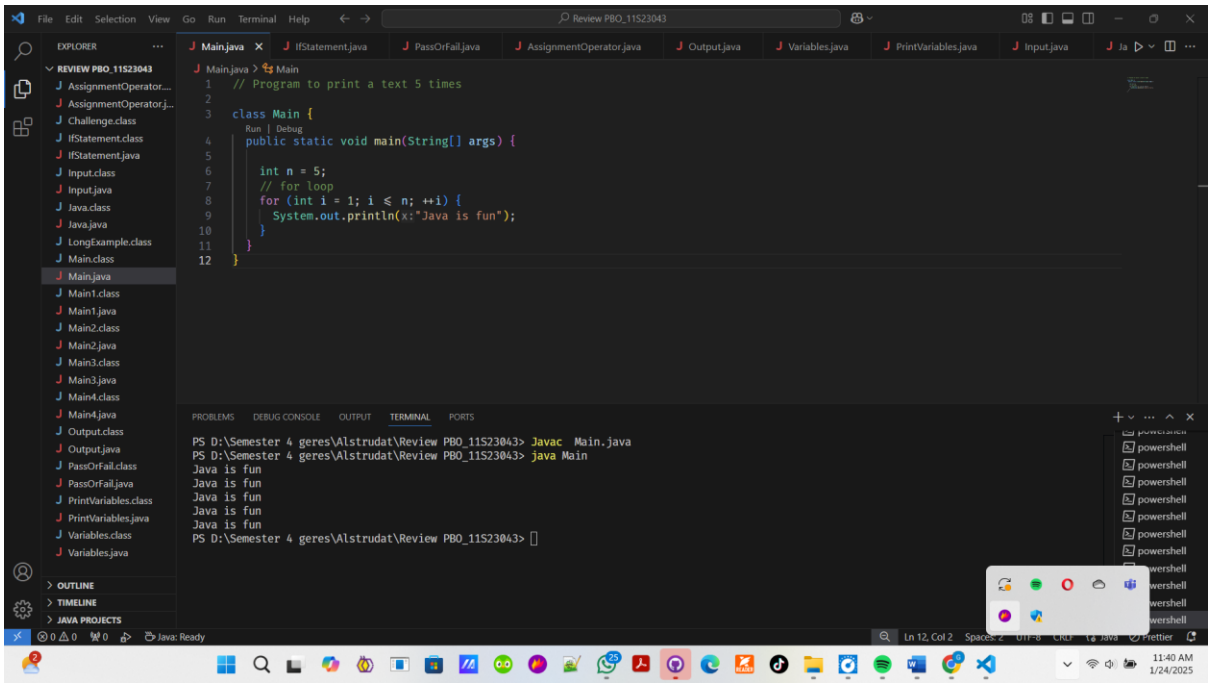


Challenge

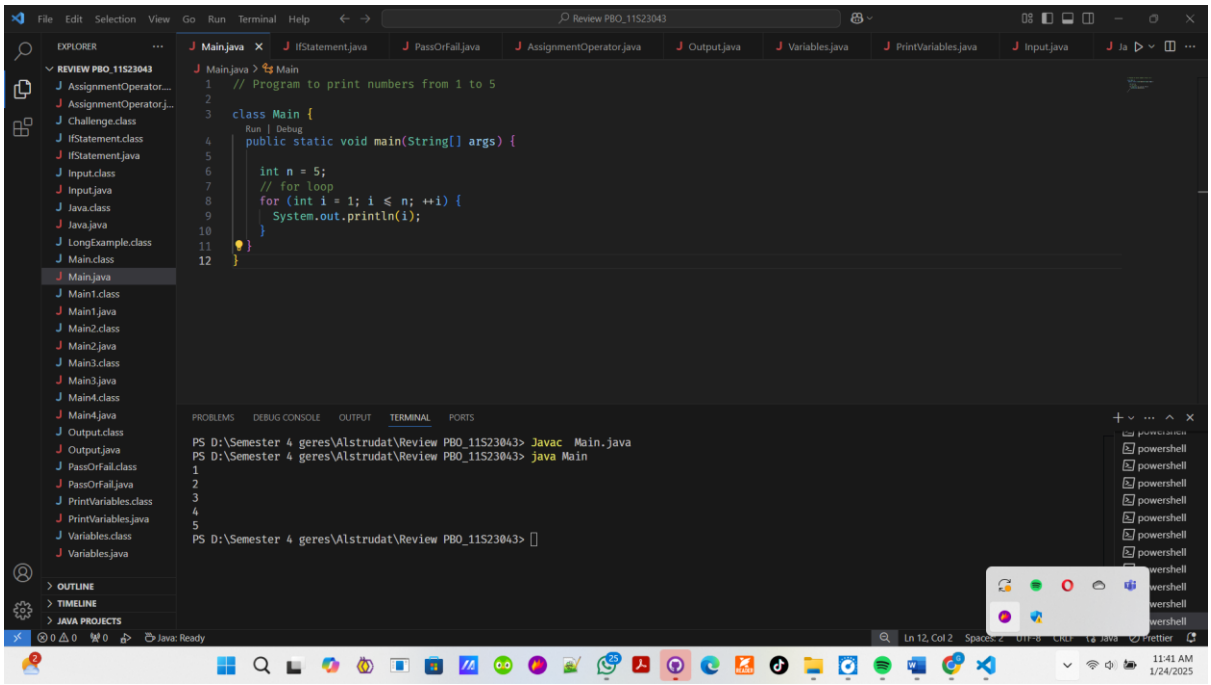


✓ Java for Loop

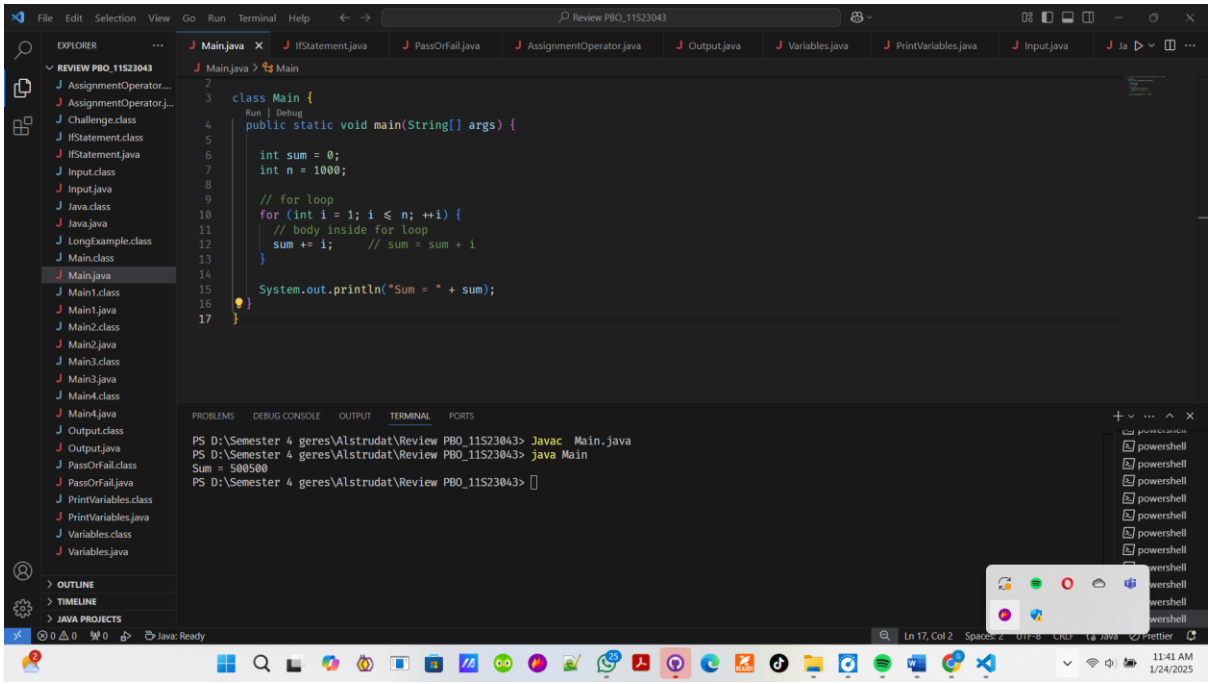
Display a Text Five Times

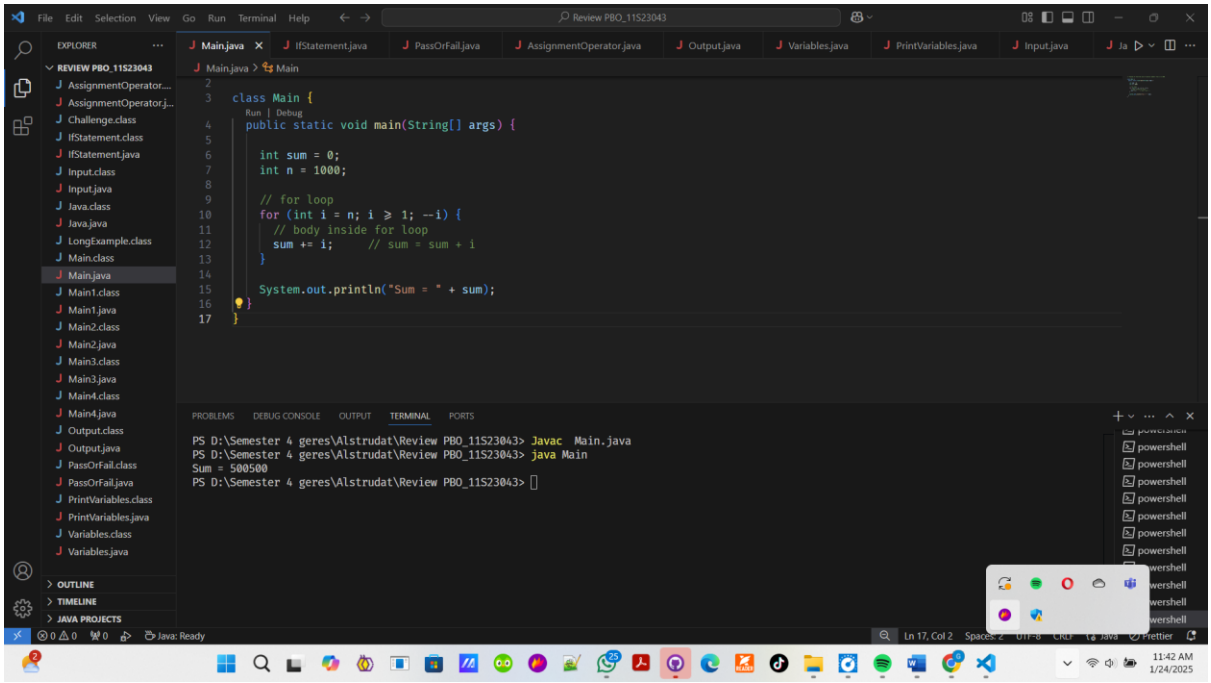


Display numbers from 1 to 5

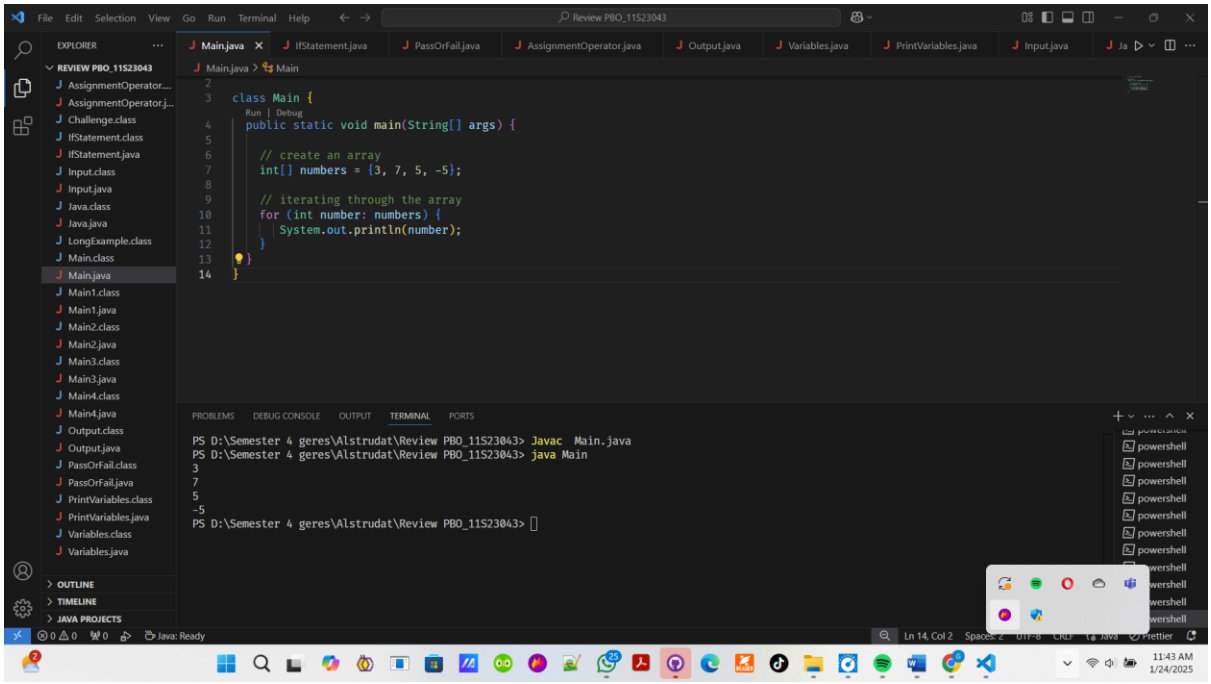


`Display Sum of n Natural Numbers`

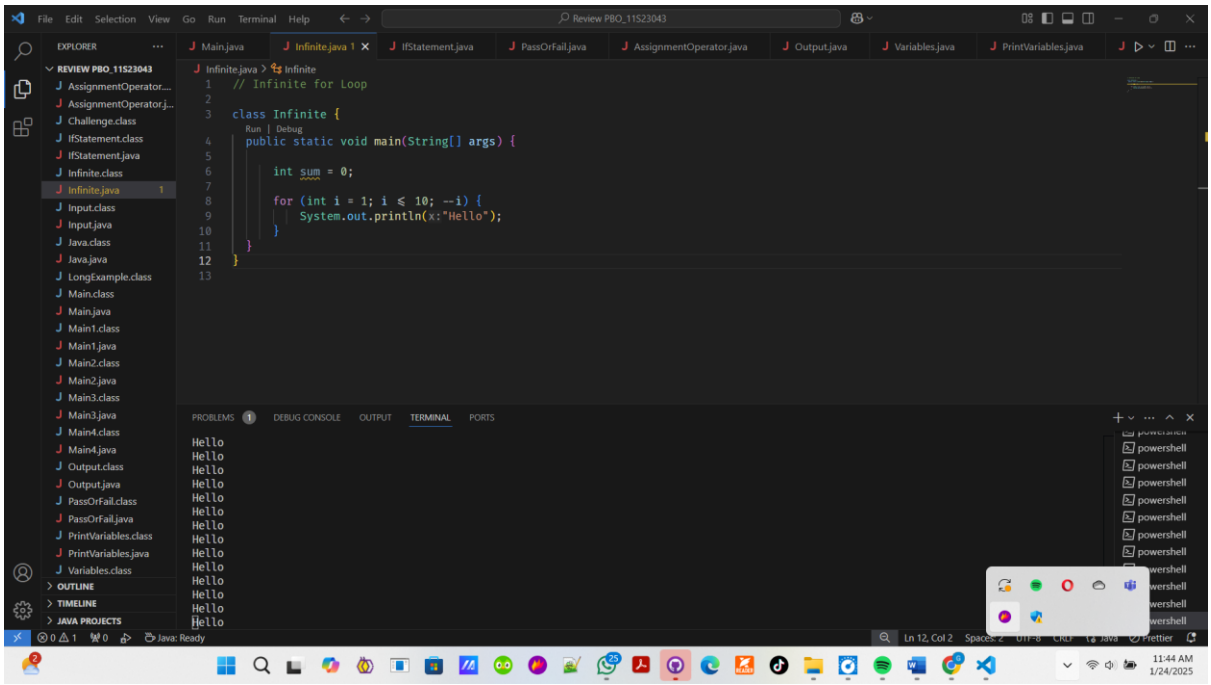




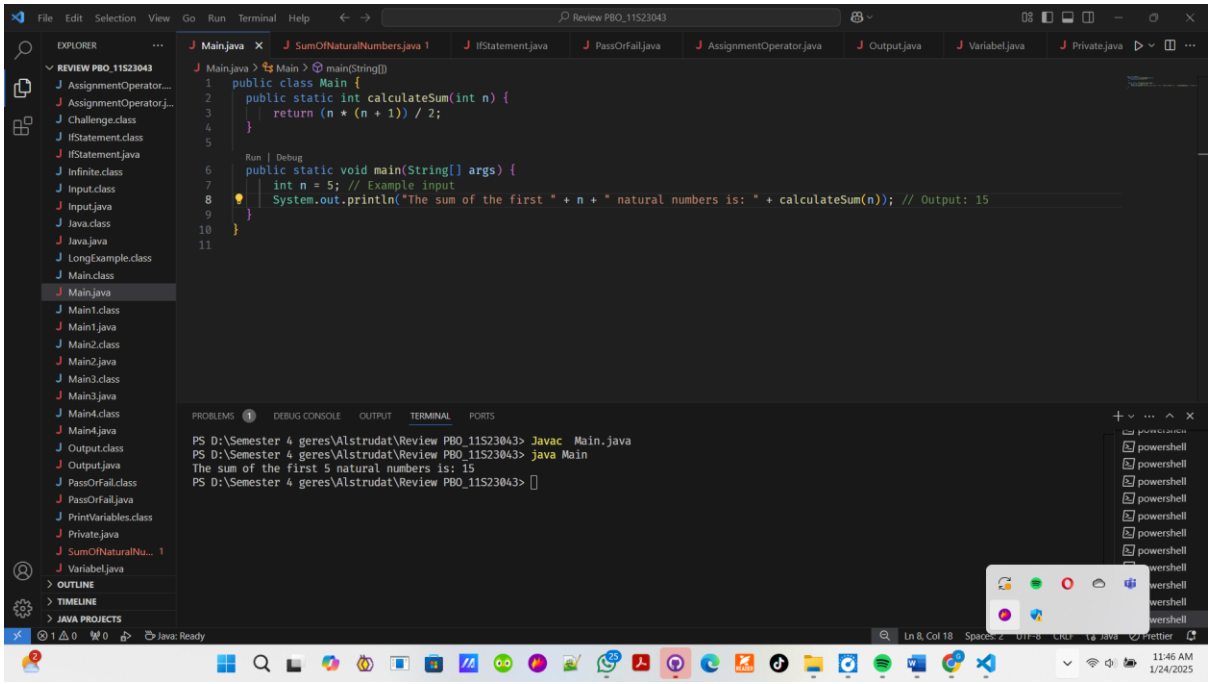
Java for-each Loop



Java Infinite for Loop

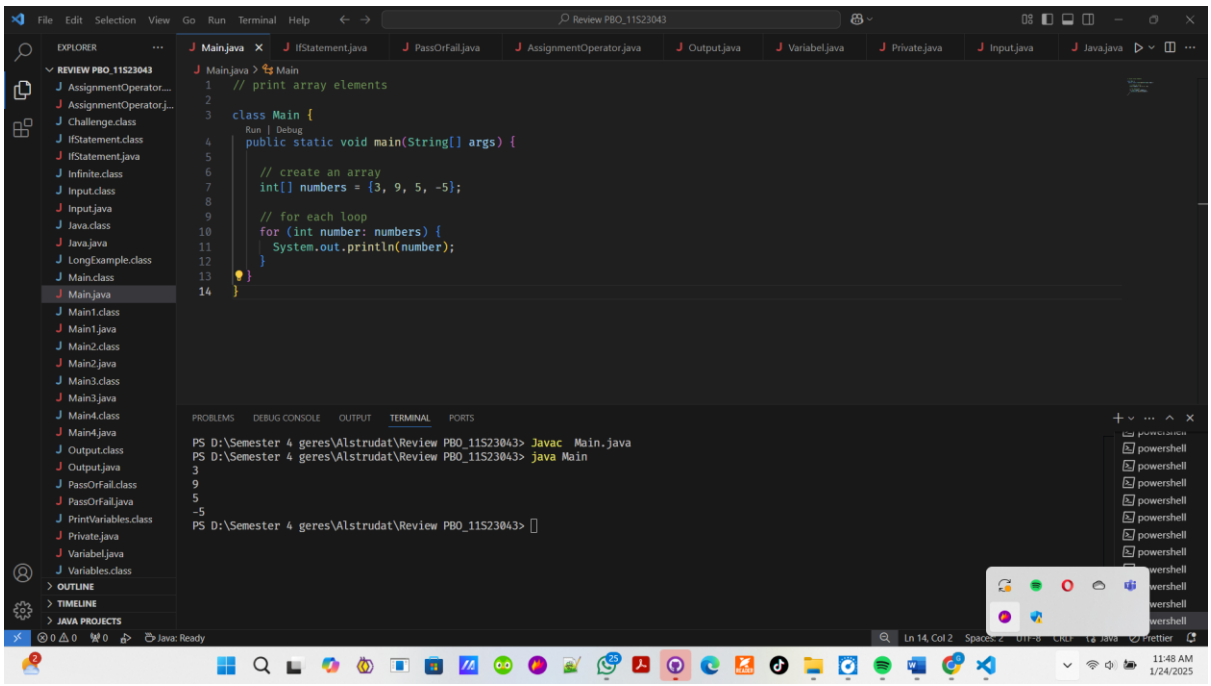


Challenge

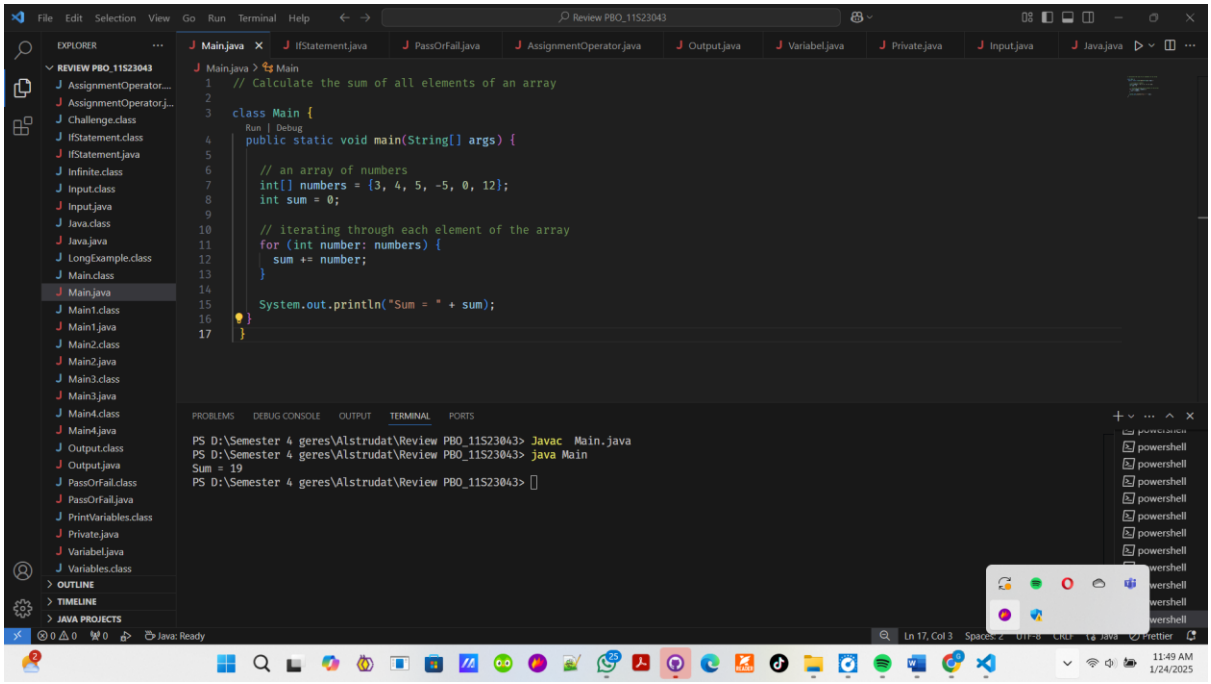


✓ Java for-each Loop

Print Array Elements

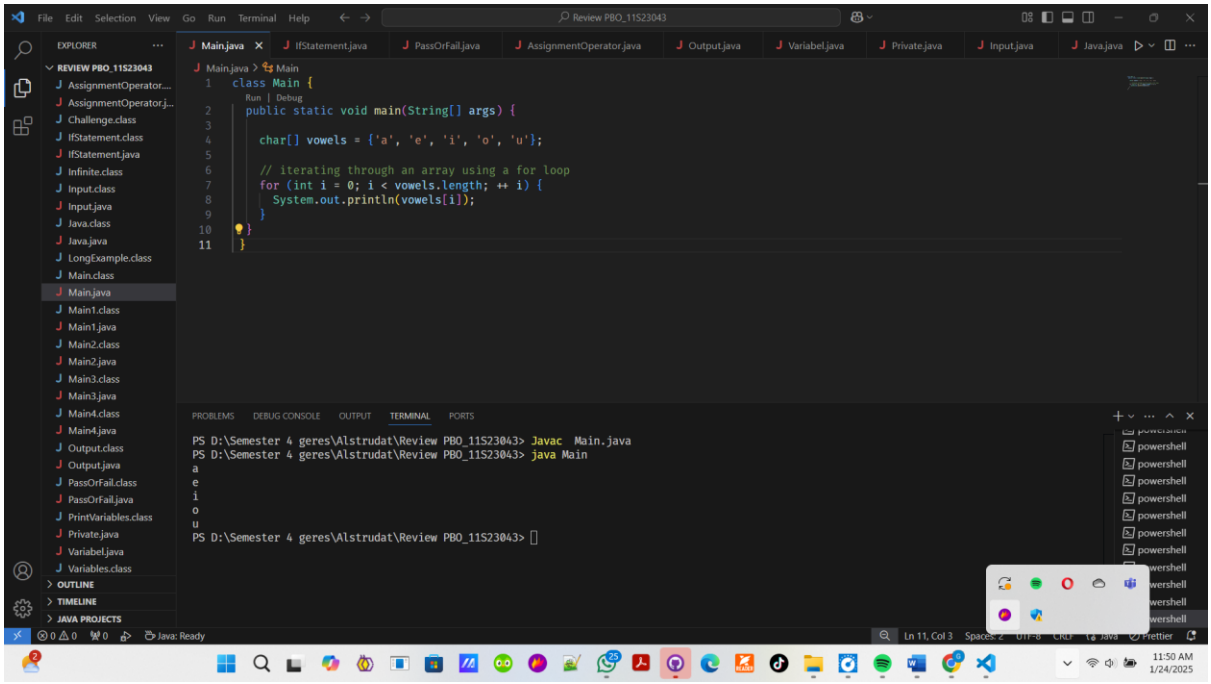


Sum of Array Elements

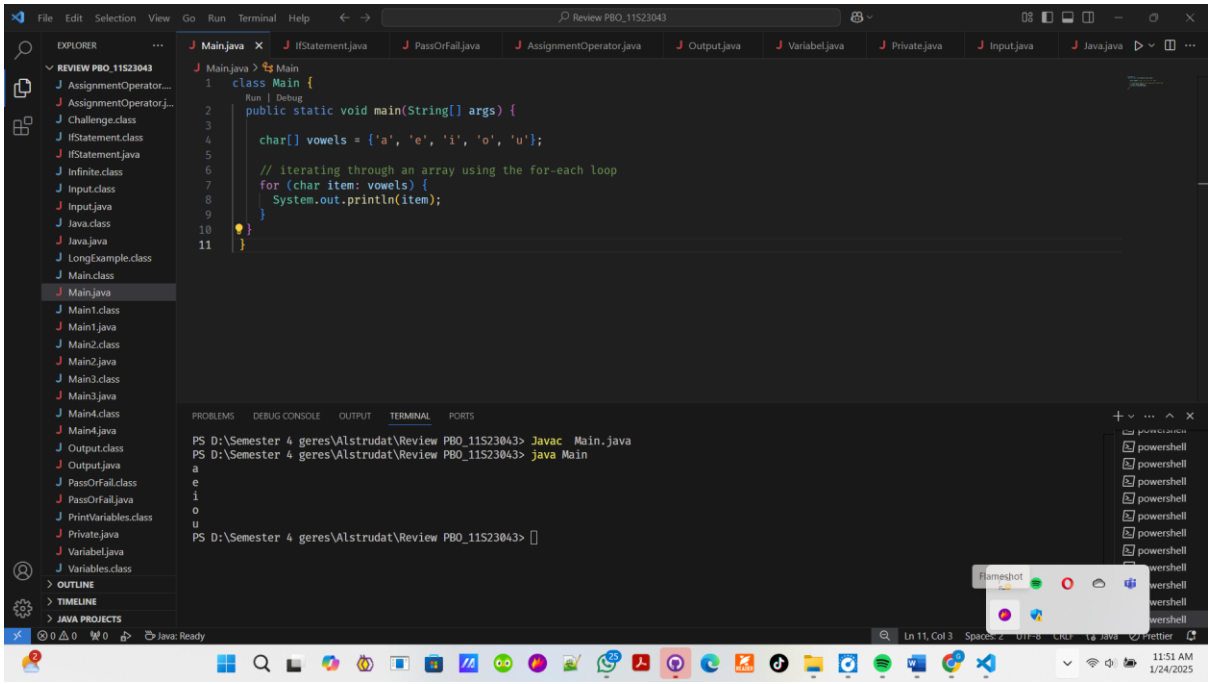


for loop Vs for-each loop

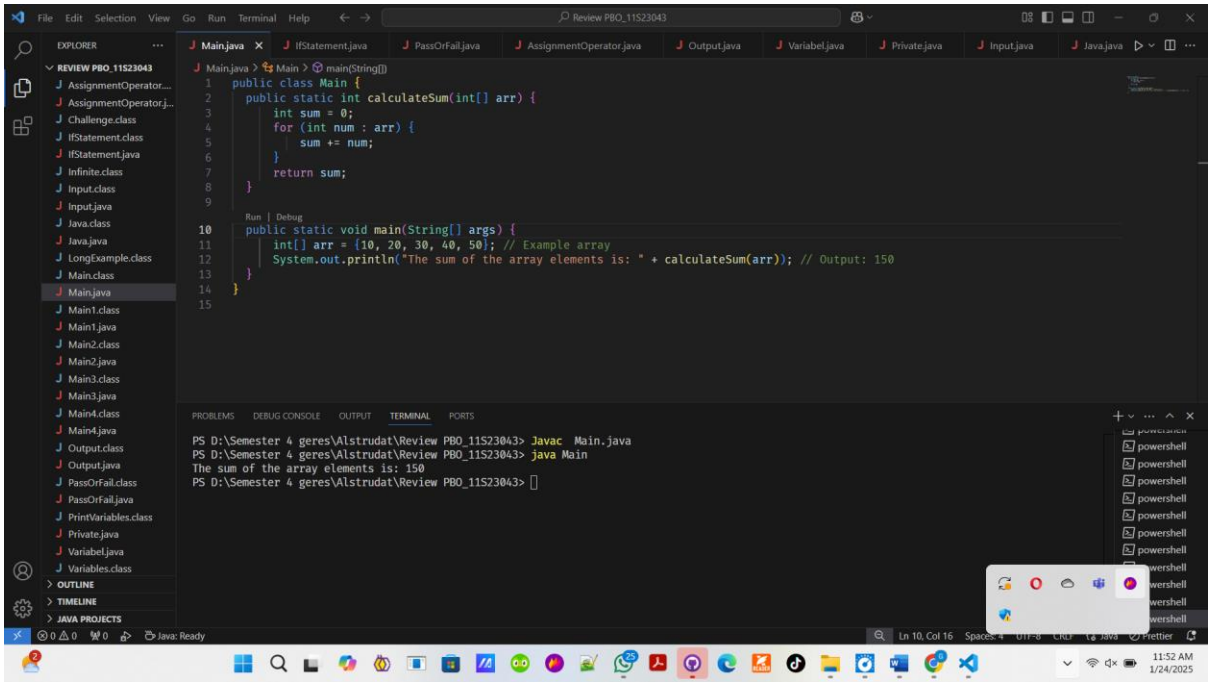
Using for loop



`Using for-each Loop`



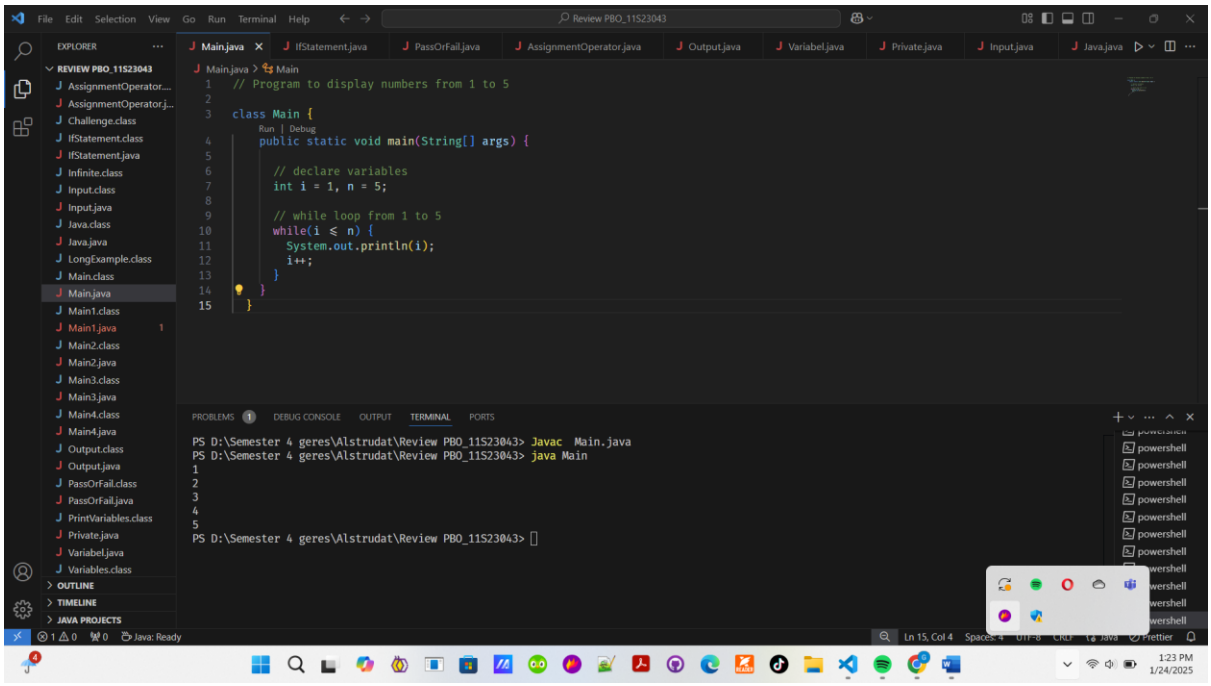
Challenge



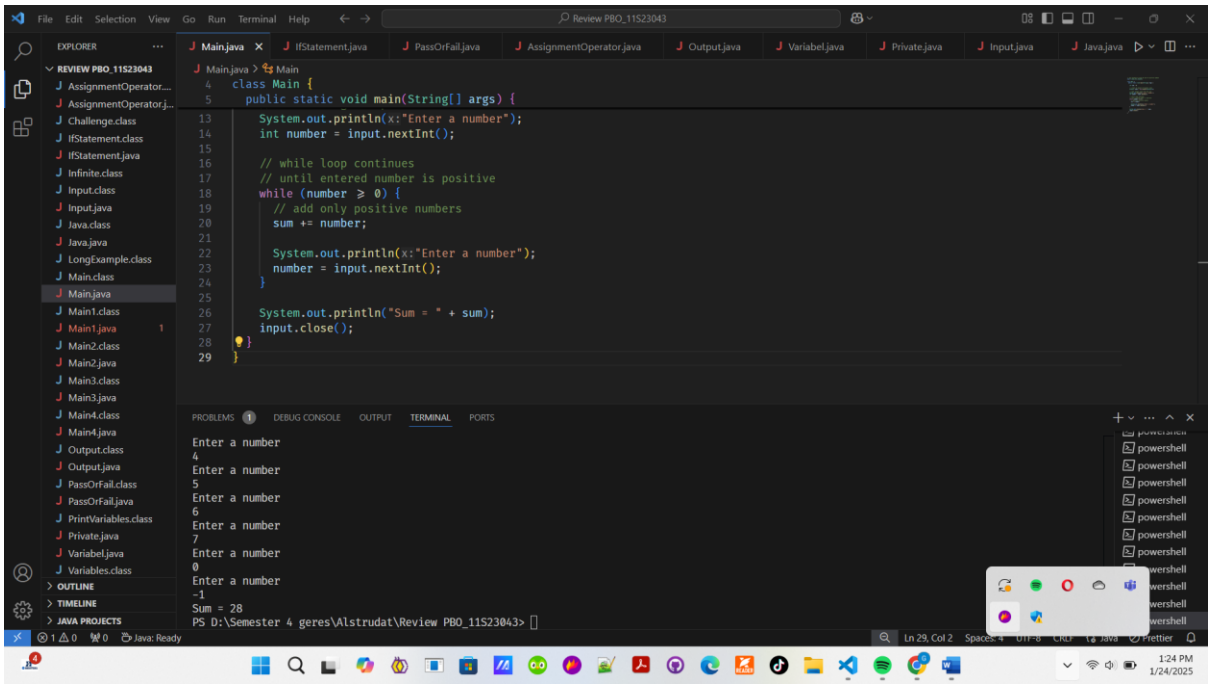
✓ Java while and do...while Loop

Java while loop

Display Numbers from 1 to 5

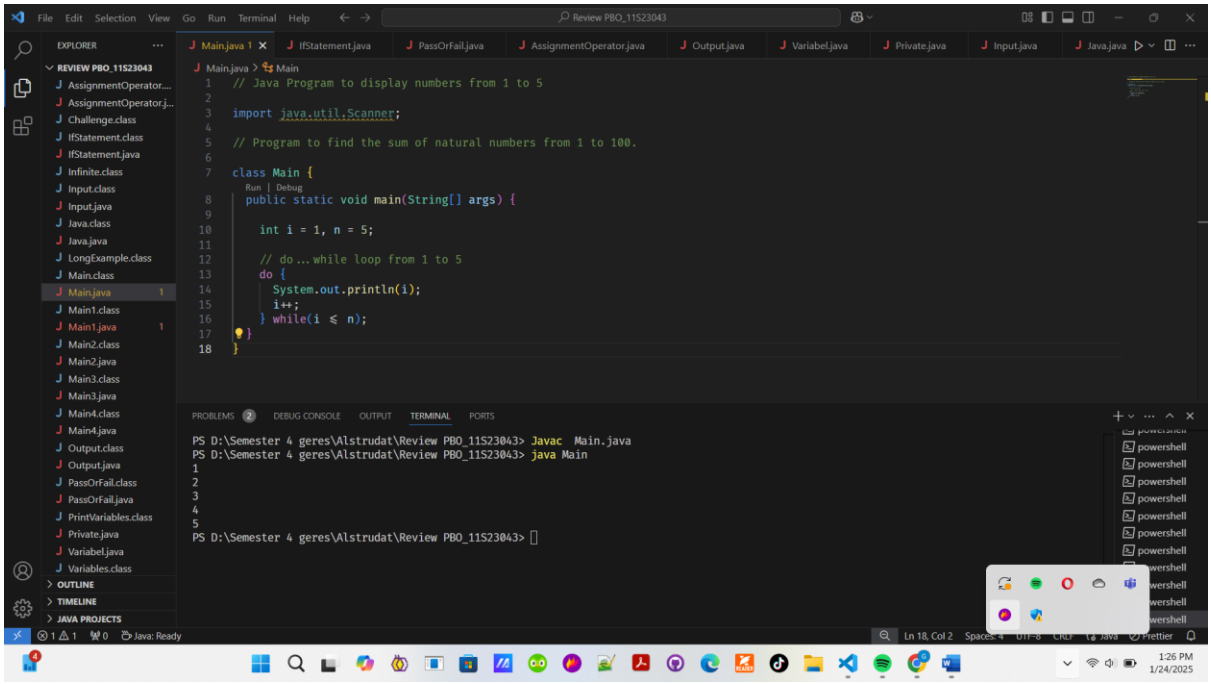


Sum of Positive Numbers Only

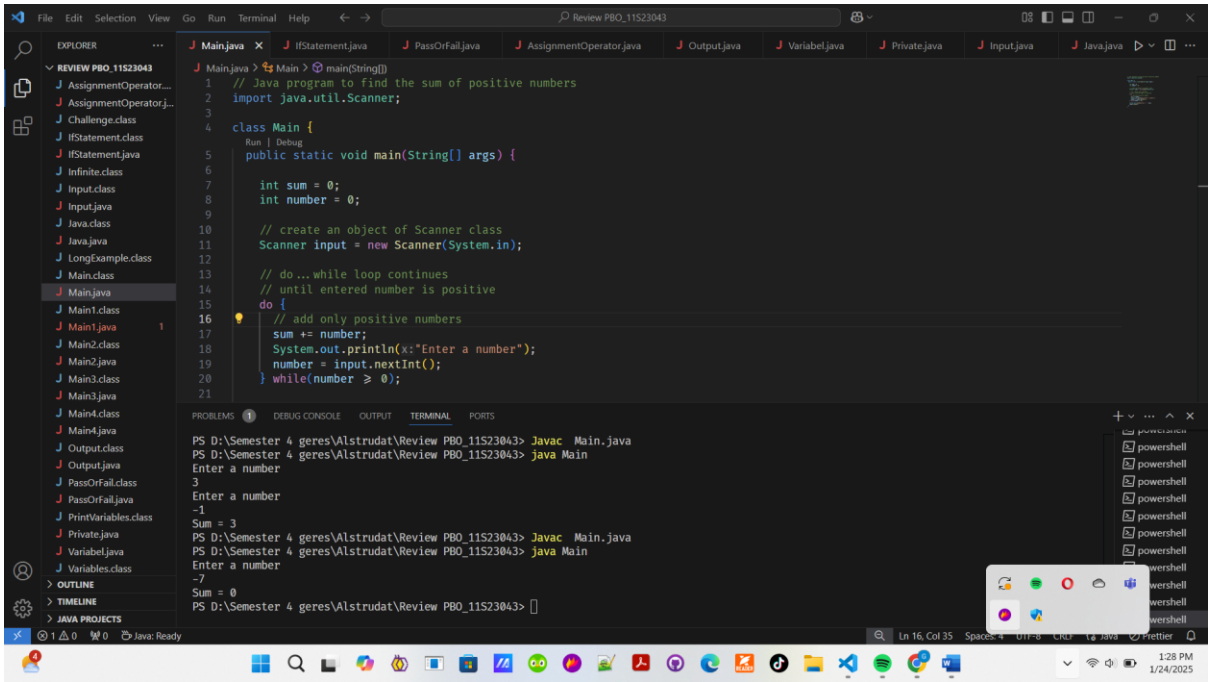


Java do...while loop

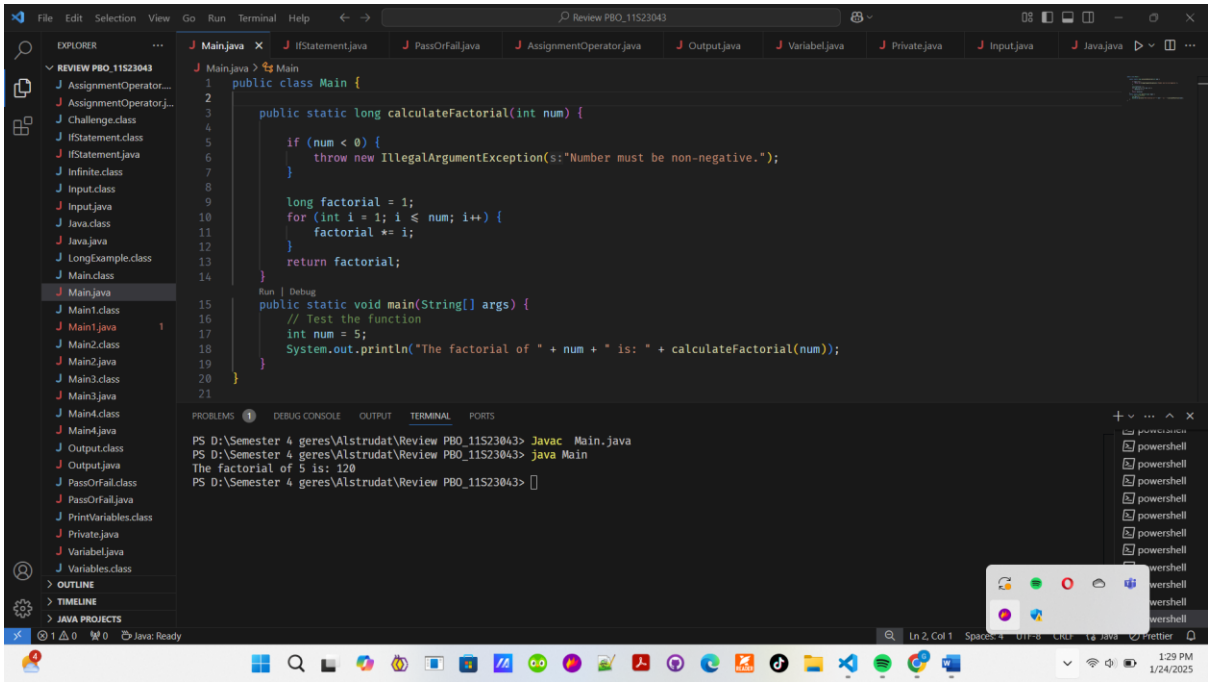
Display Numbers from 1 to 5



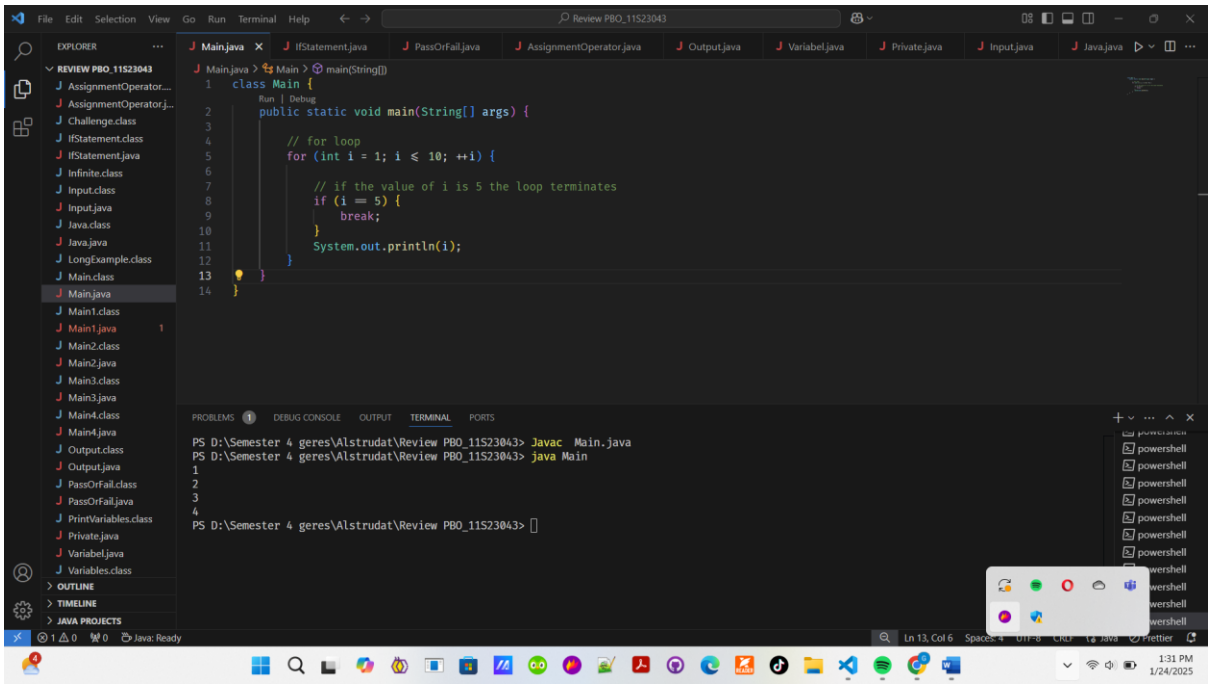
Sum of Positive Numbers



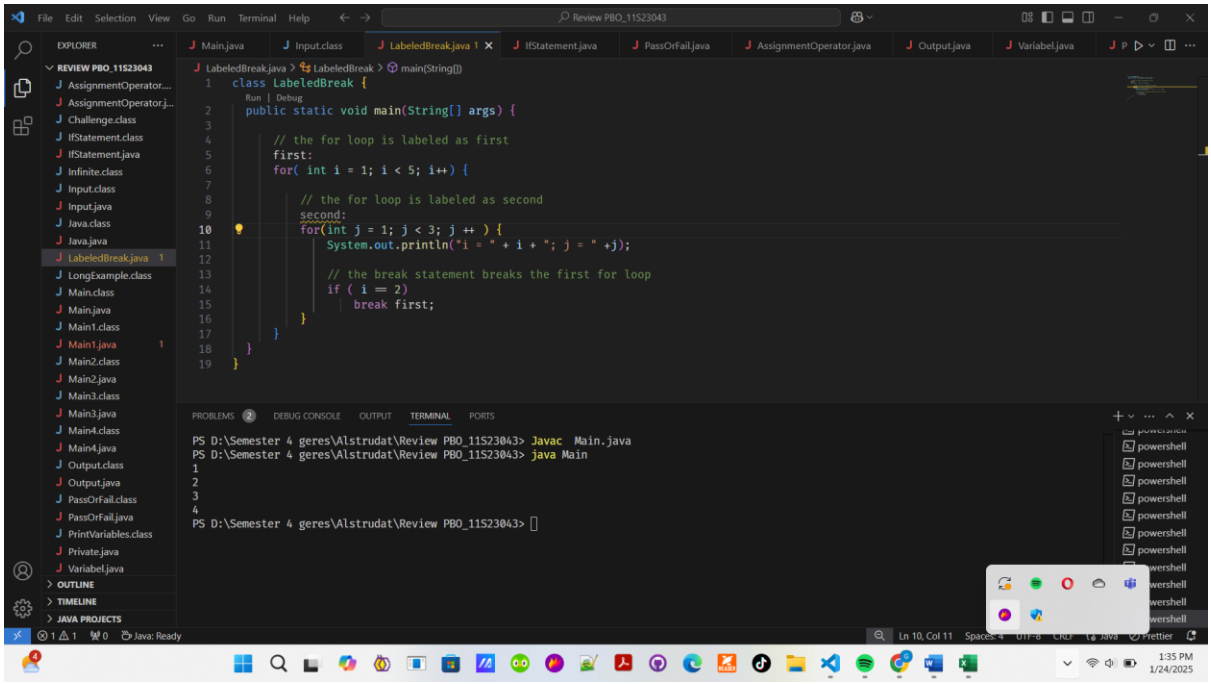
Challenge



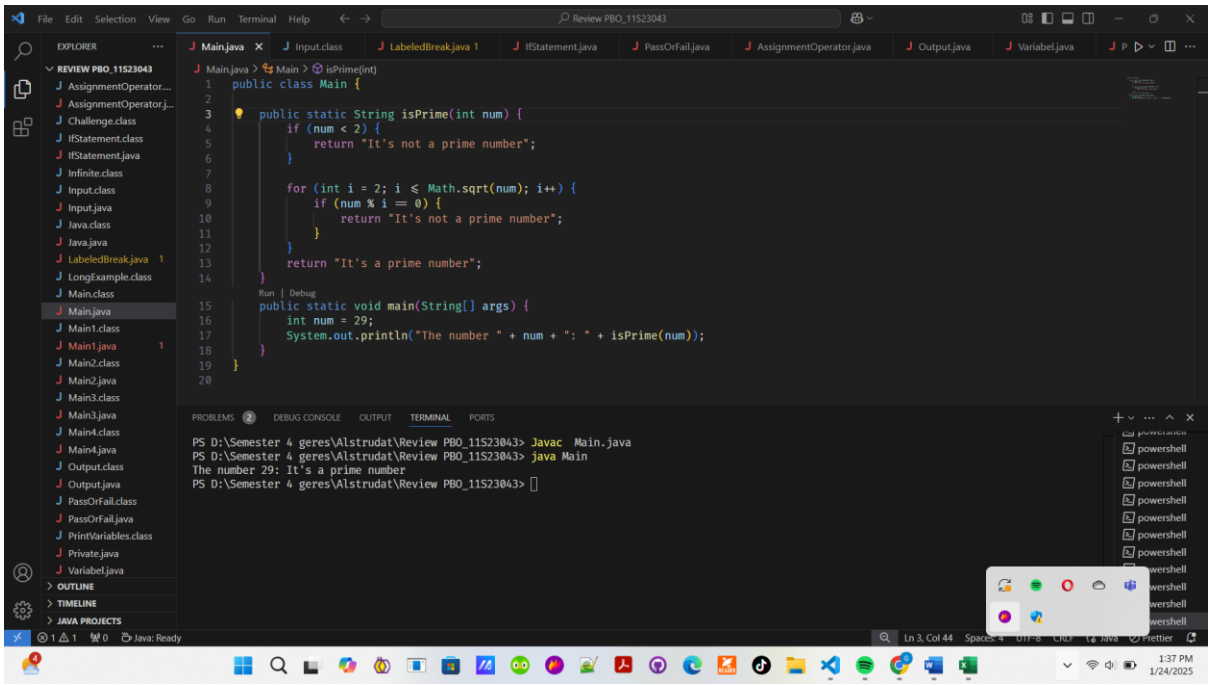
Java break statement



`labeled break Statement`



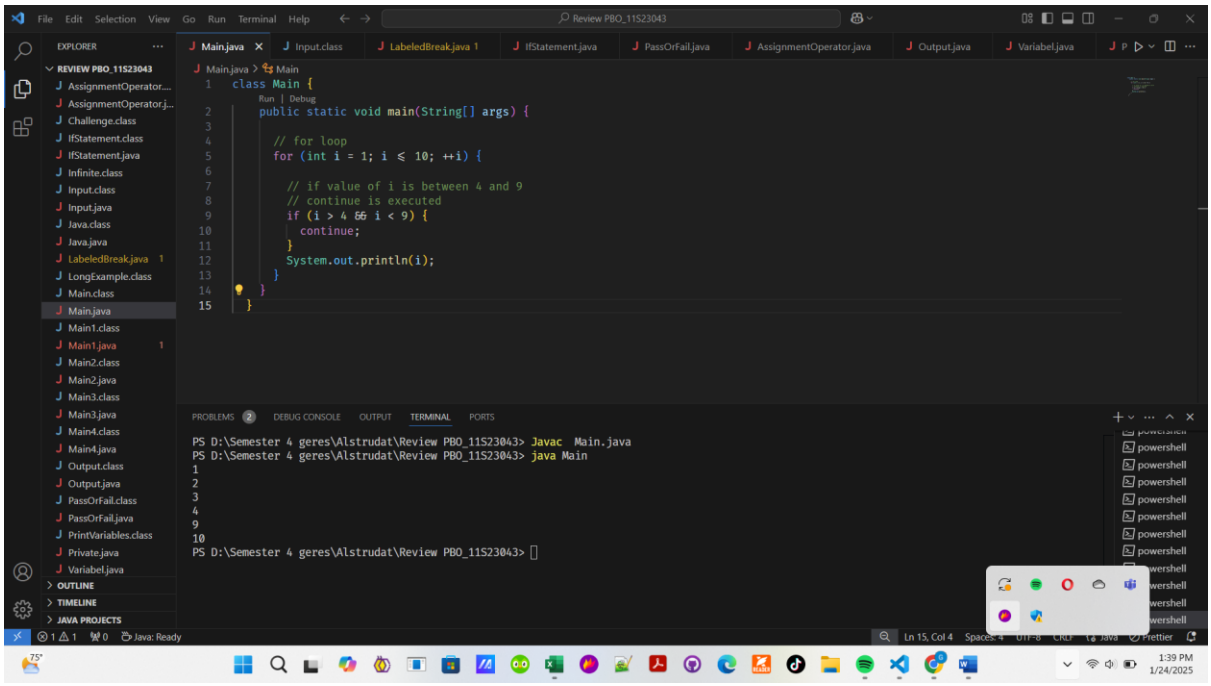
Challenge



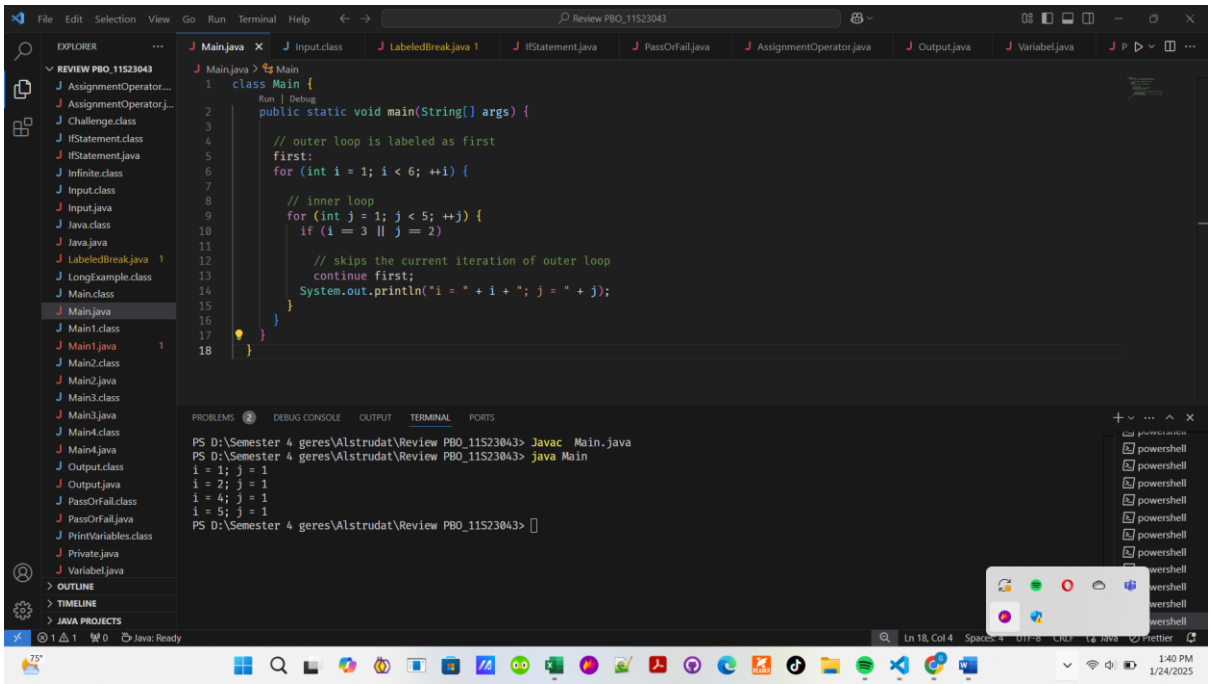
✓ Java continue Statement

Java continue

Java continue statement

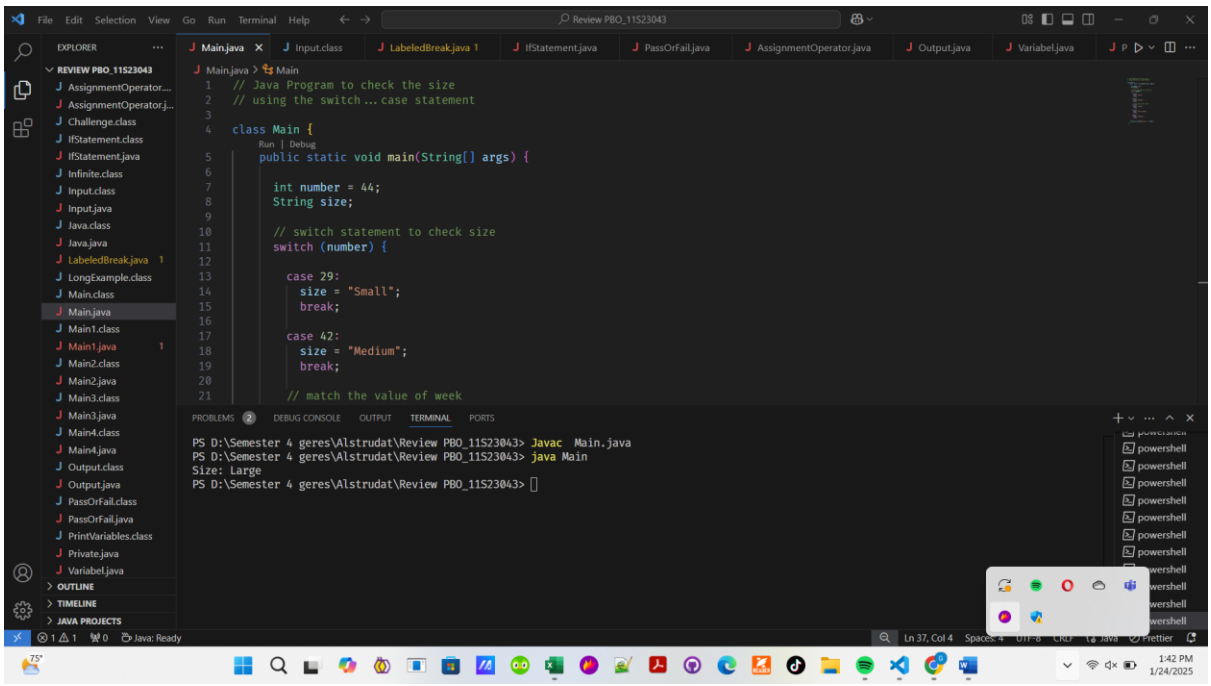


labeled continue Statement

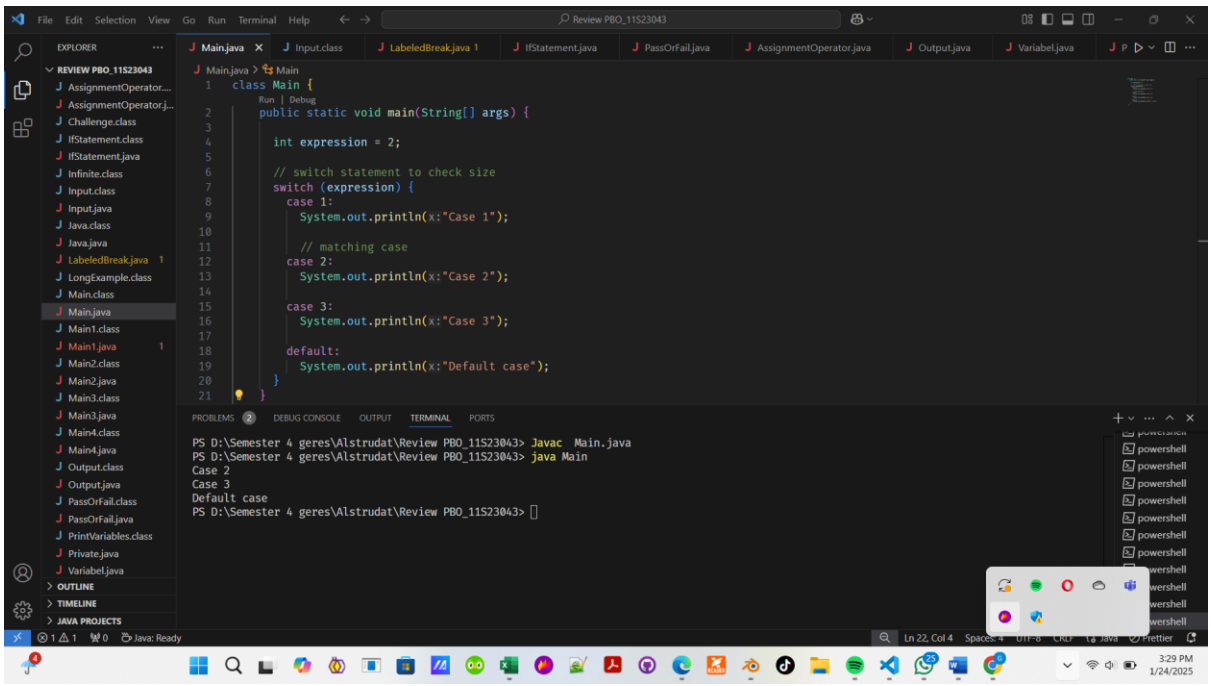


✓ Java switch Statement

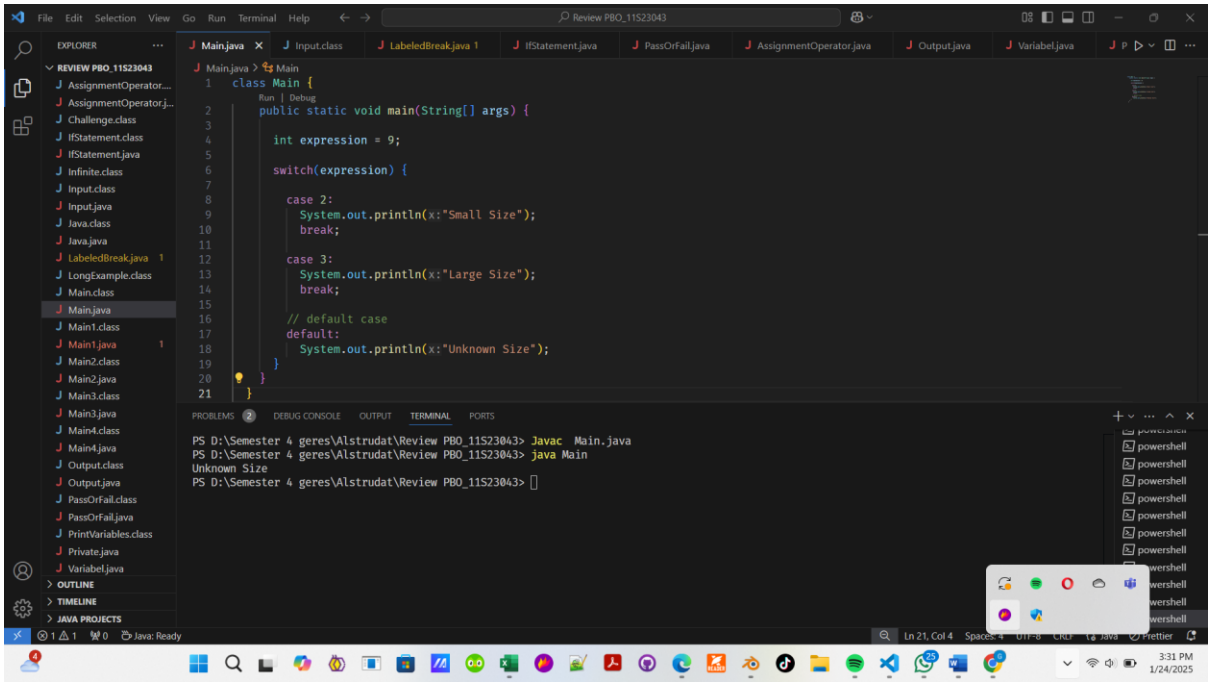
Java switch Statement



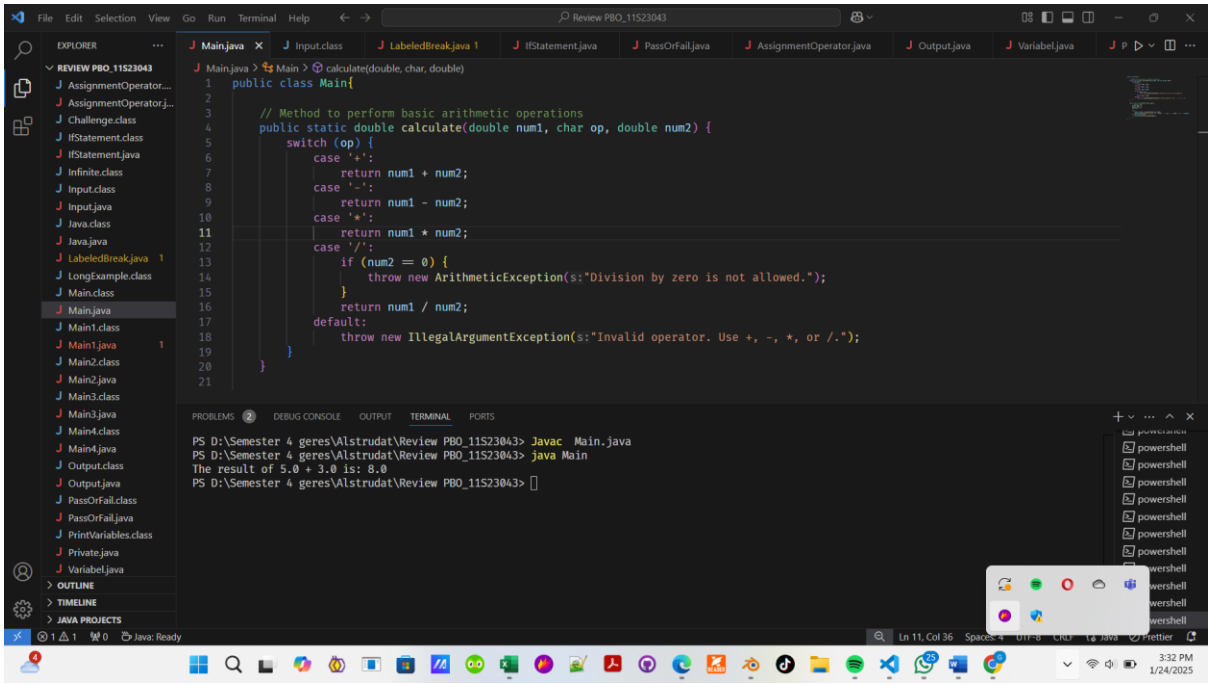
break Statement in Java switch...case



`default Case in Java switch-case`

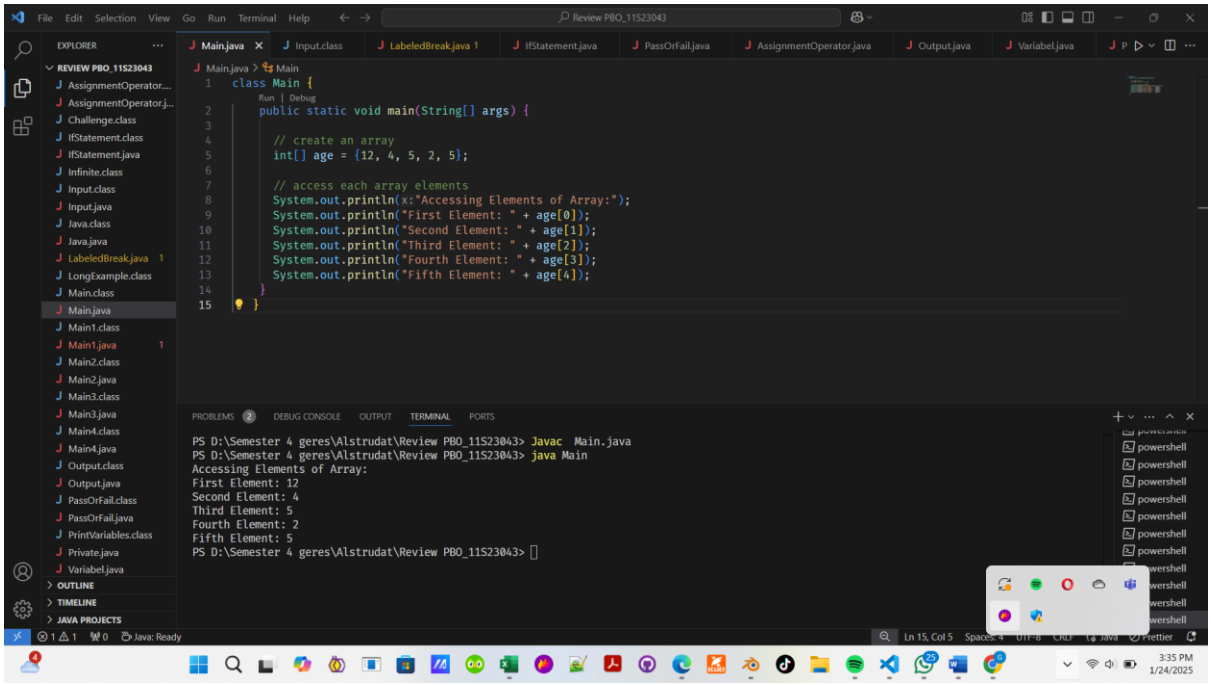


Challenge



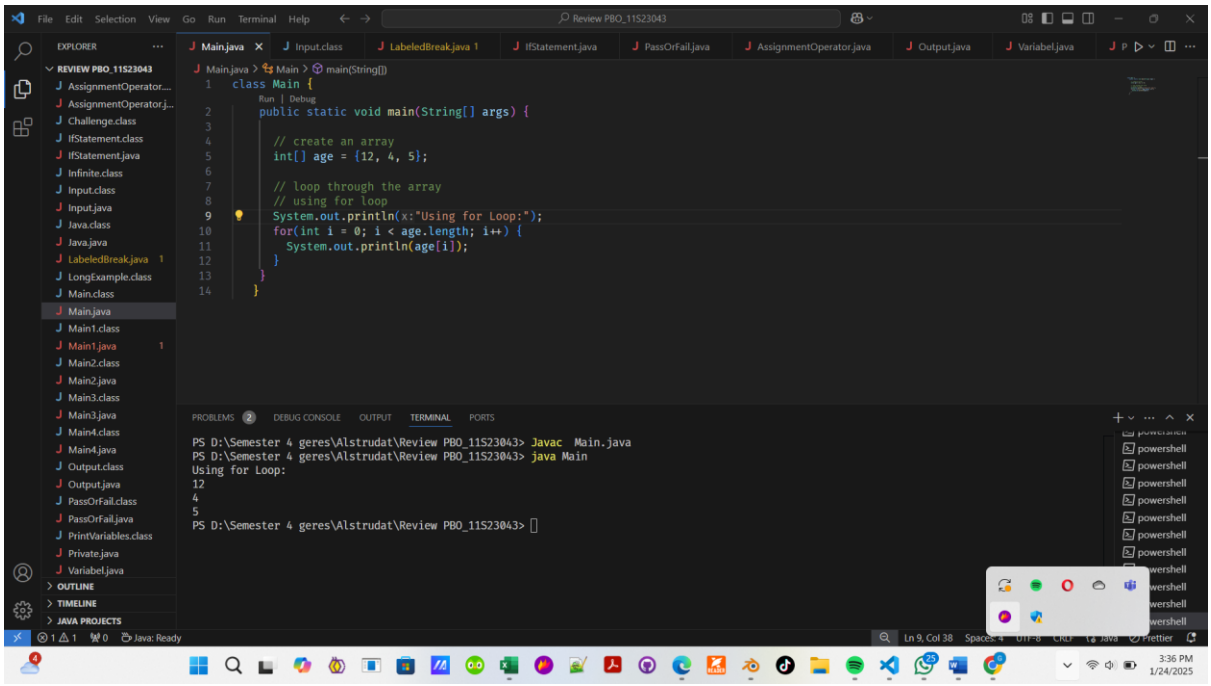
- **Java Arrays**

Access Array Elements

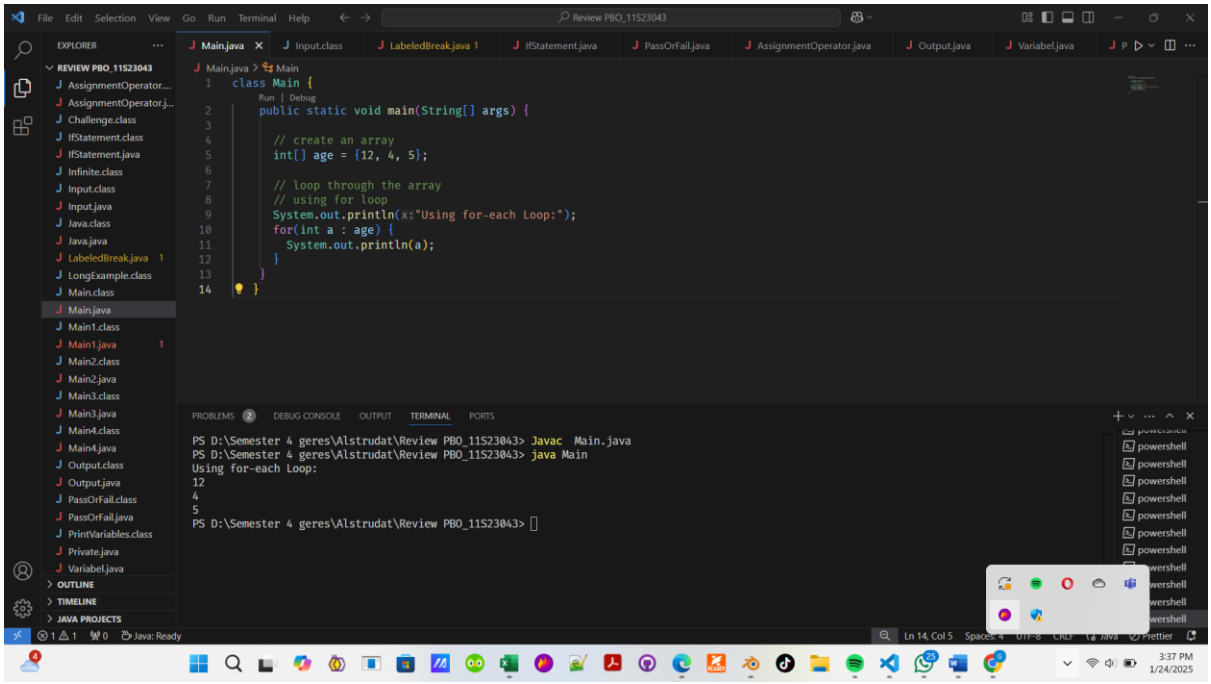


Looping Through Array Elements

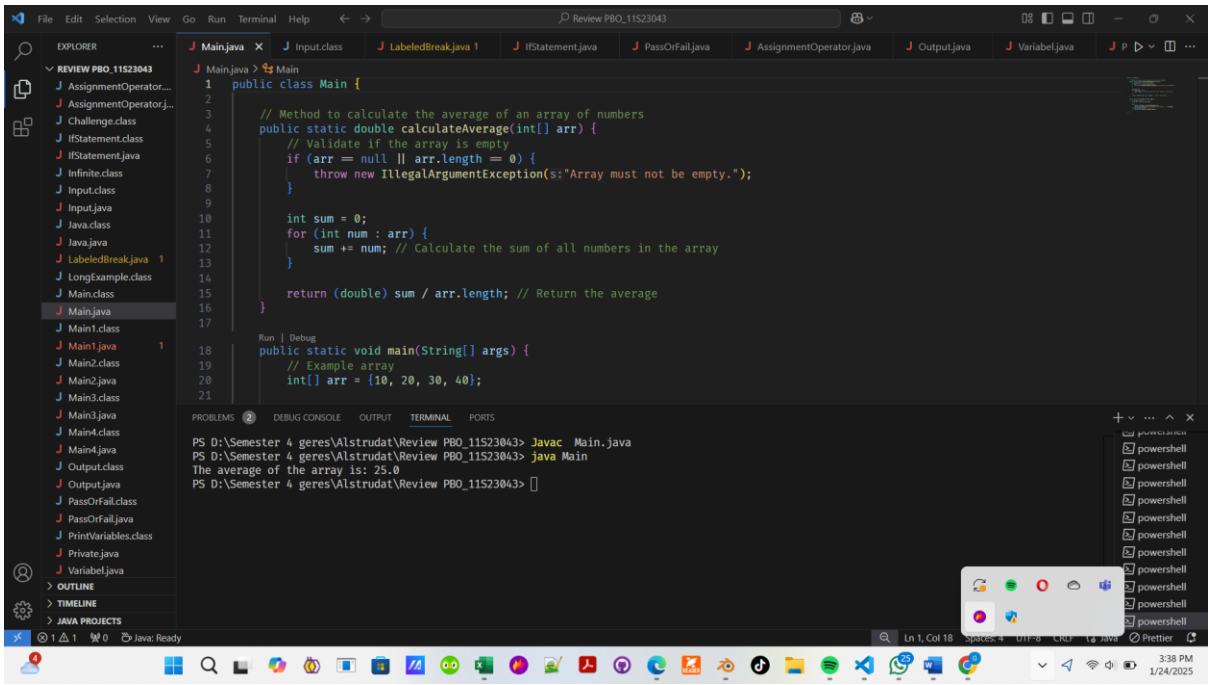
Using For Loop



`Using the for-each Loop`

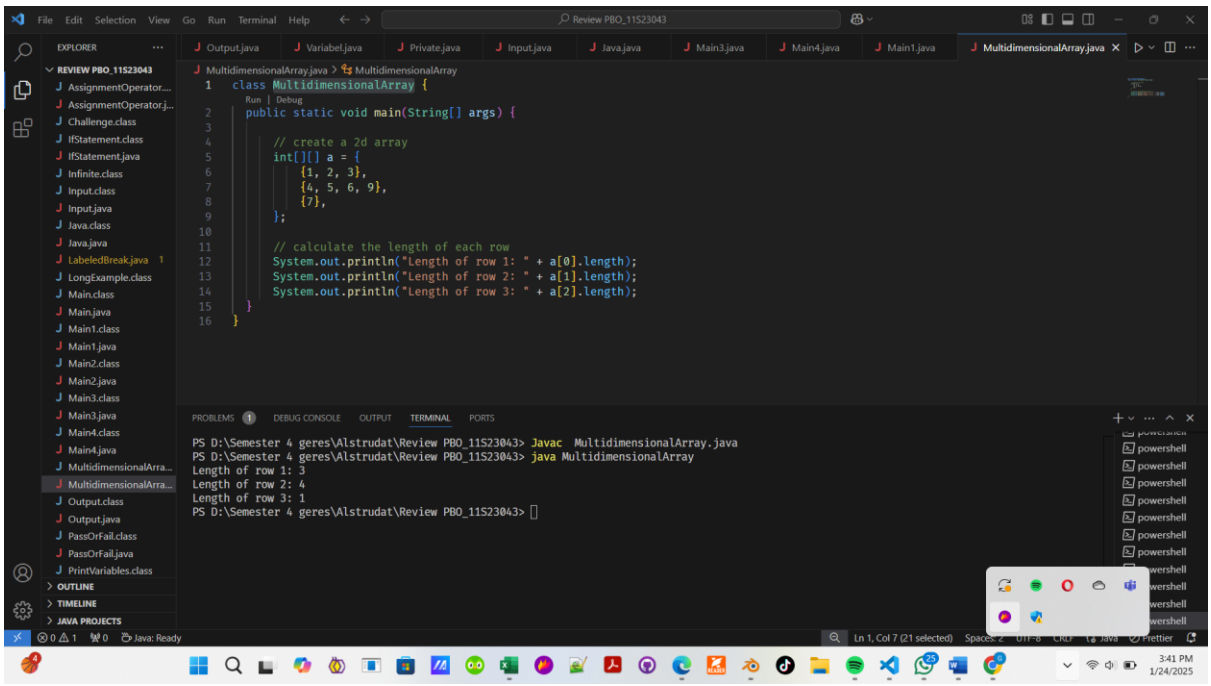


Challenge

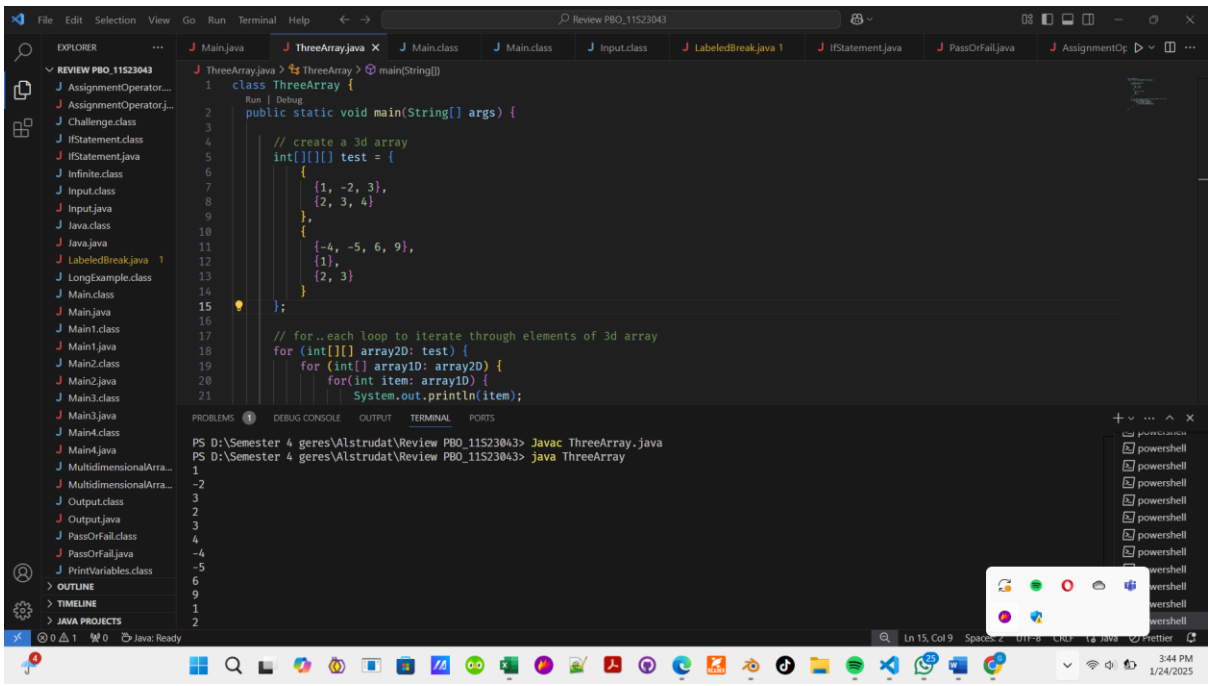


✓ Java Multidimensional Arrays

2-dimensional Array

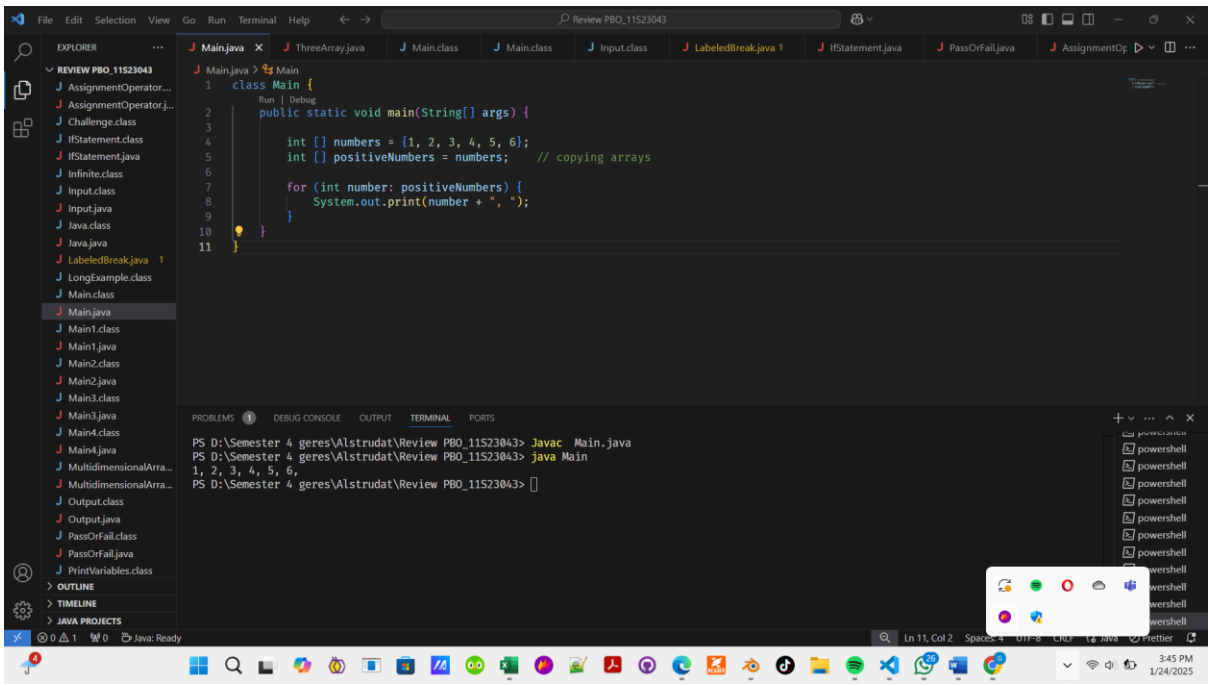


3-dimensional Array

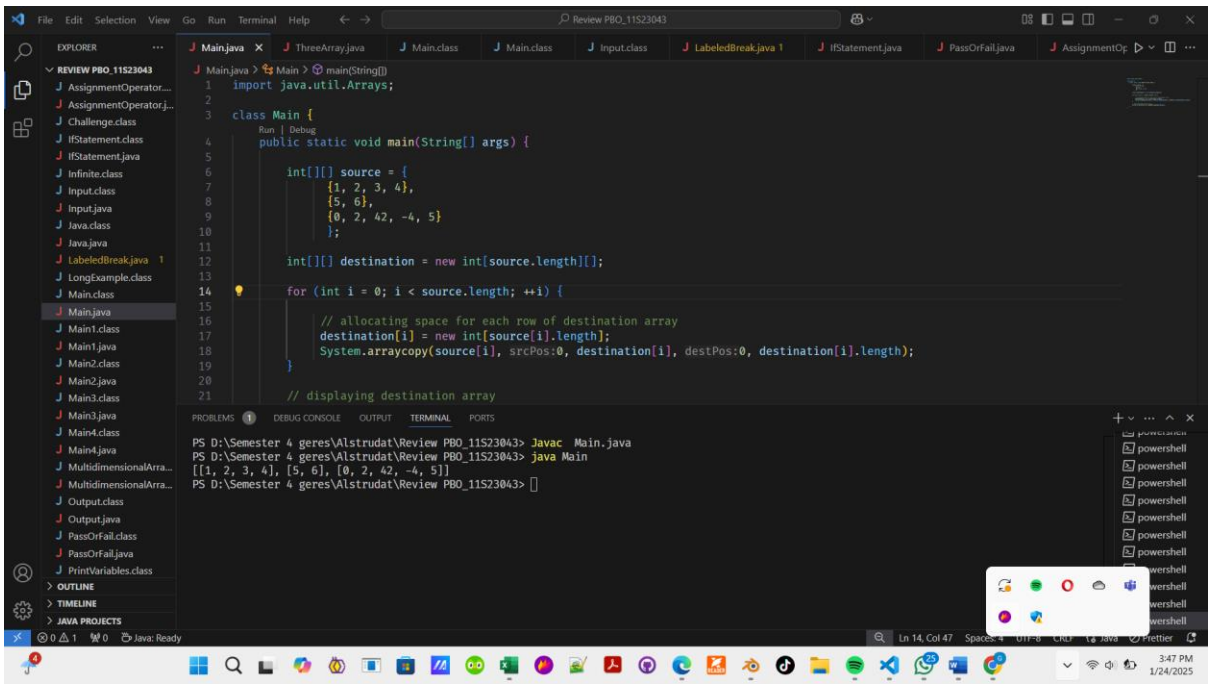


✓ Java Copy Arrays

Copying Arrays Using Assignment Operator



Copying 2d Arrays using arraycopy()



✓ Java Class and Objects

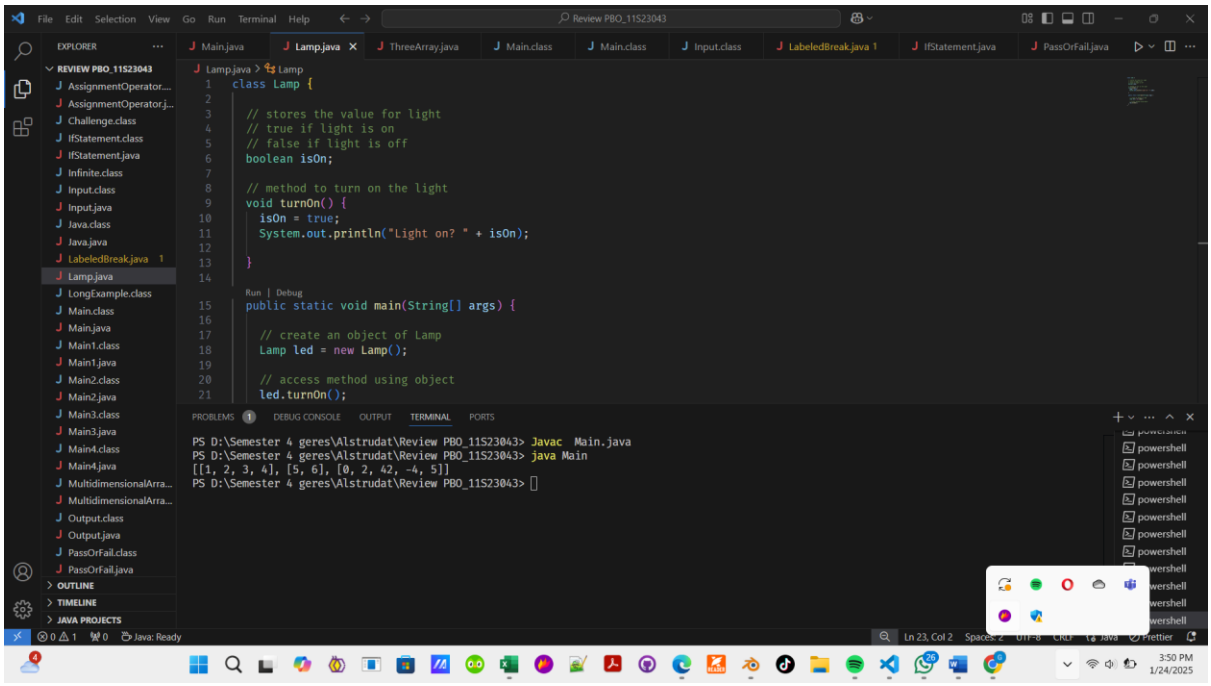
Java Class

```
class ClassName {
  // fields
  // methods
}
```

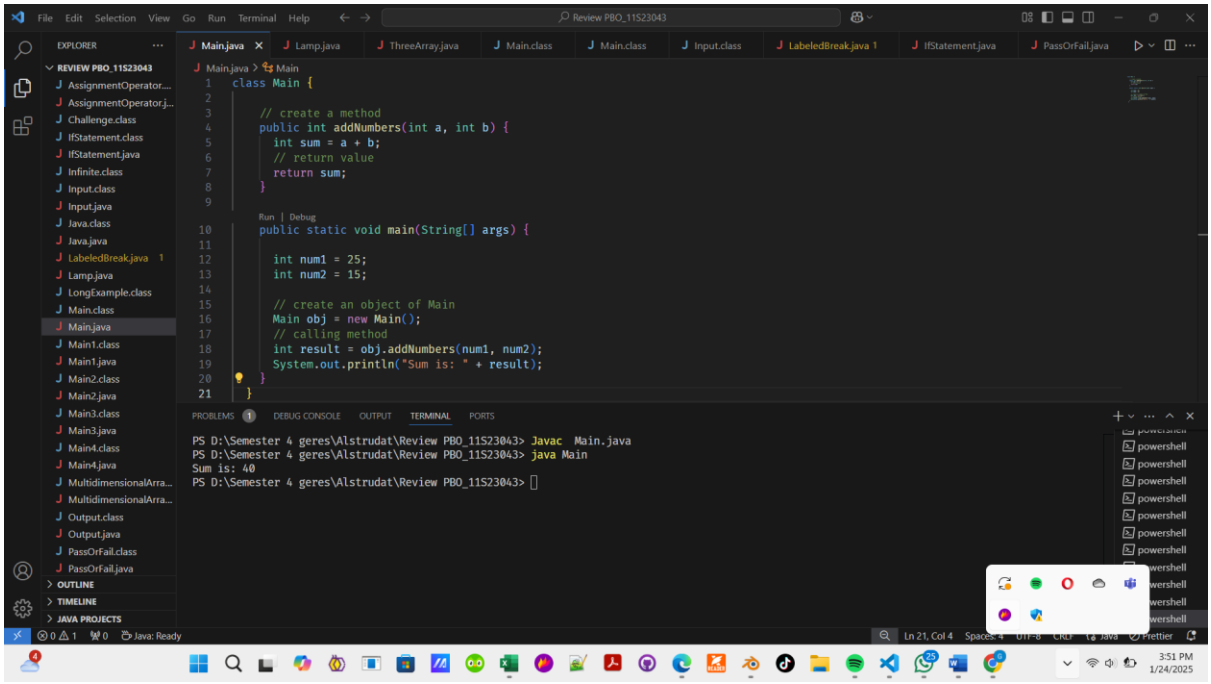
Java Objects

```
className object = new className();

// for Bicycle class
Bicycle sportsBicycle = new Bicycle();

Bicycle touringBicycle = new Bicycle();
```

Create objects inside the same class

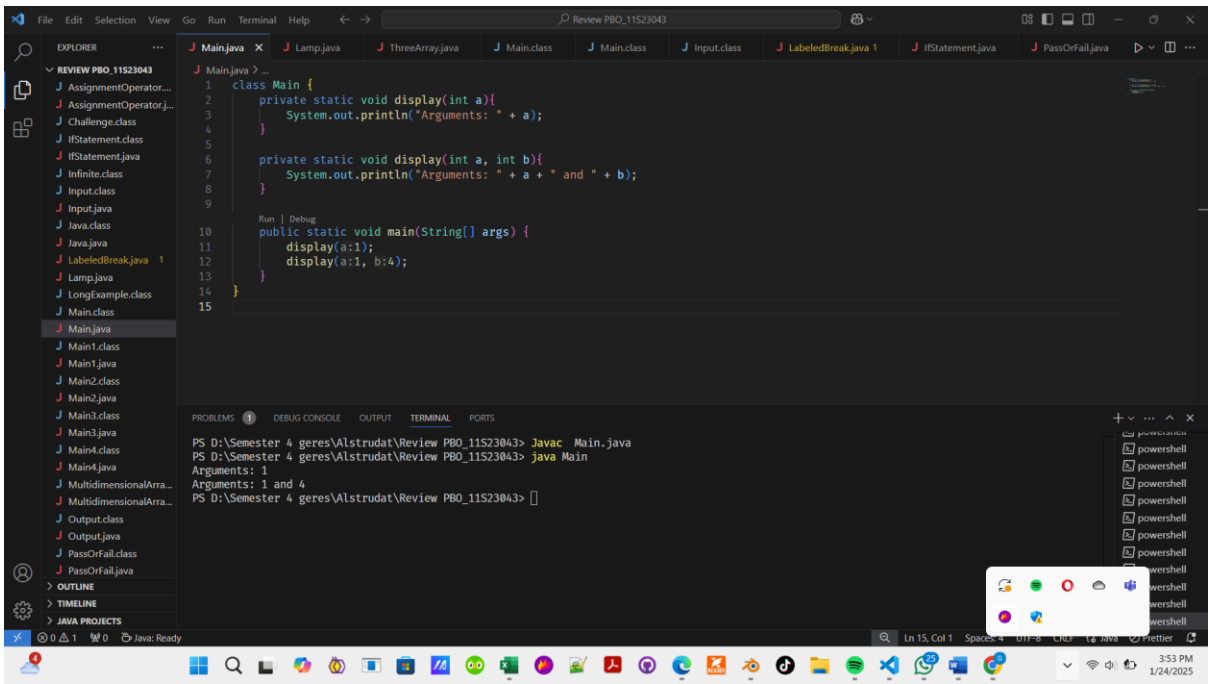


Java Methods



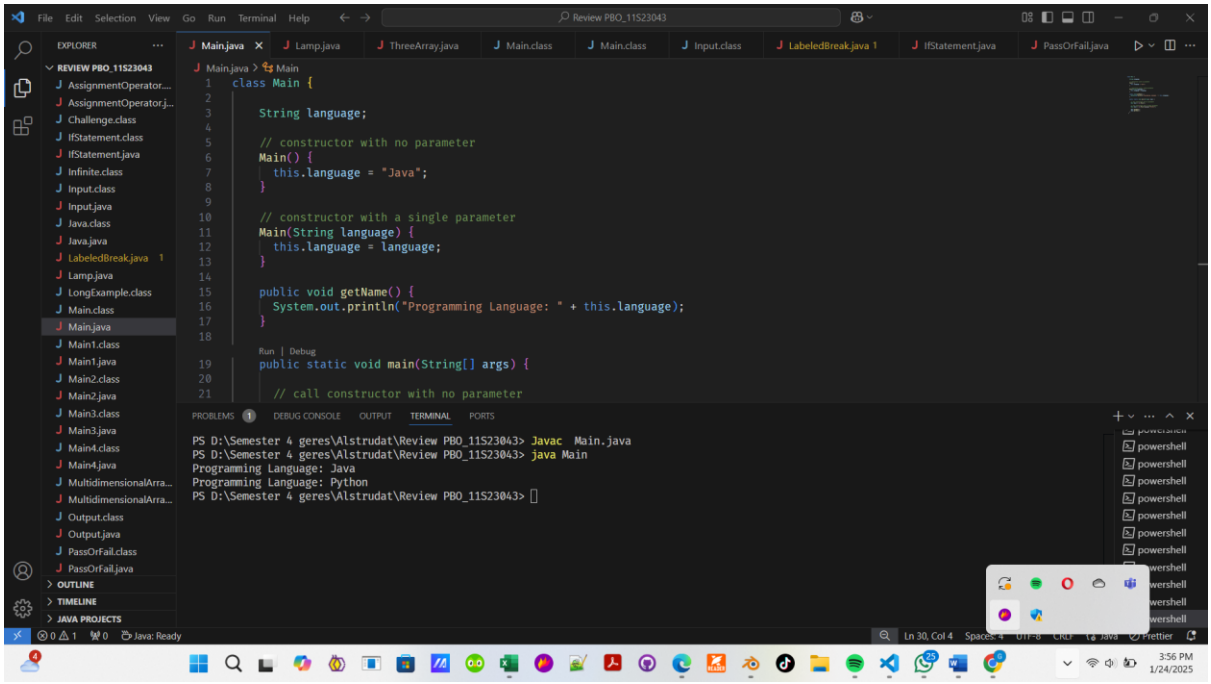
✓ Java Method Overloading

Overloading by changing the number of parameters



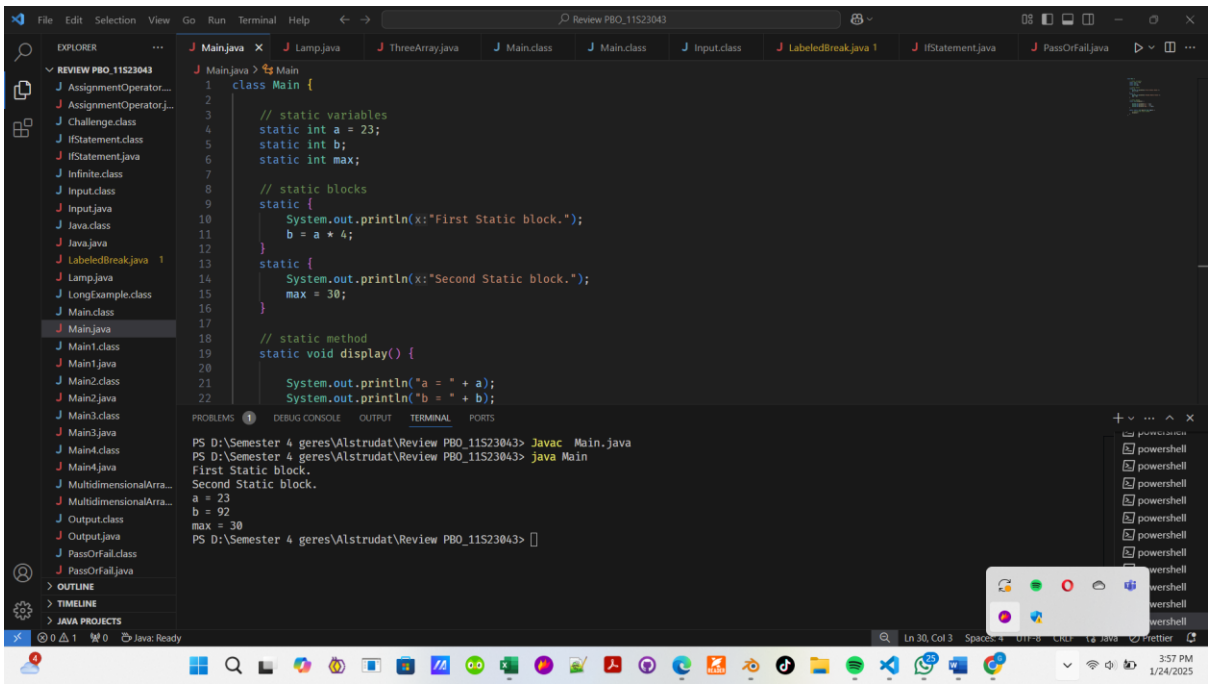
✓ Java Constructors

Java Constructor Overloading



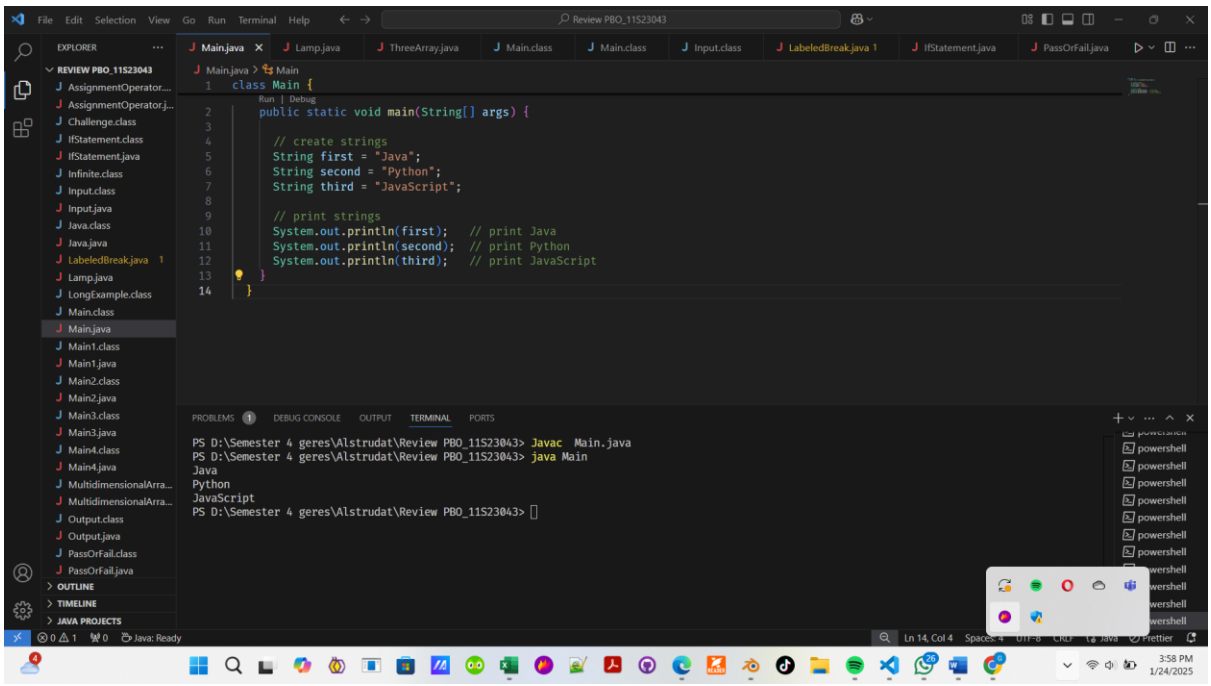
✓ Java Static Keyword

Use of static block in java

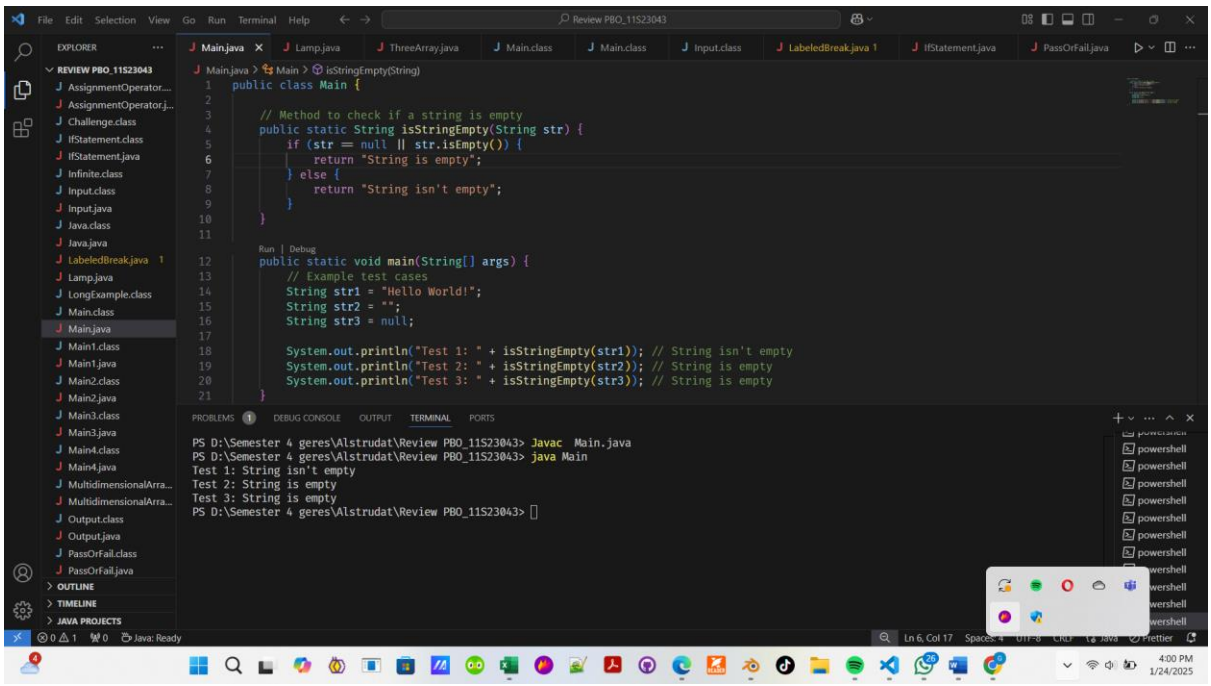


✓ Java Strings

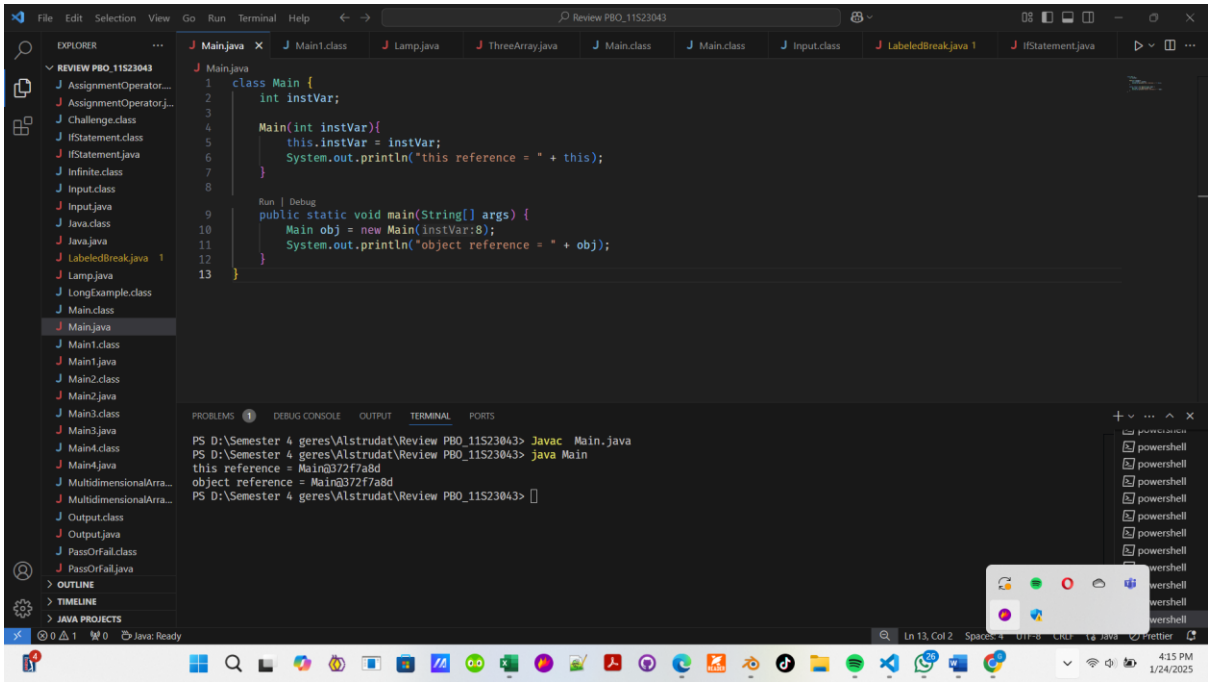
Create a String in Java



Challenge

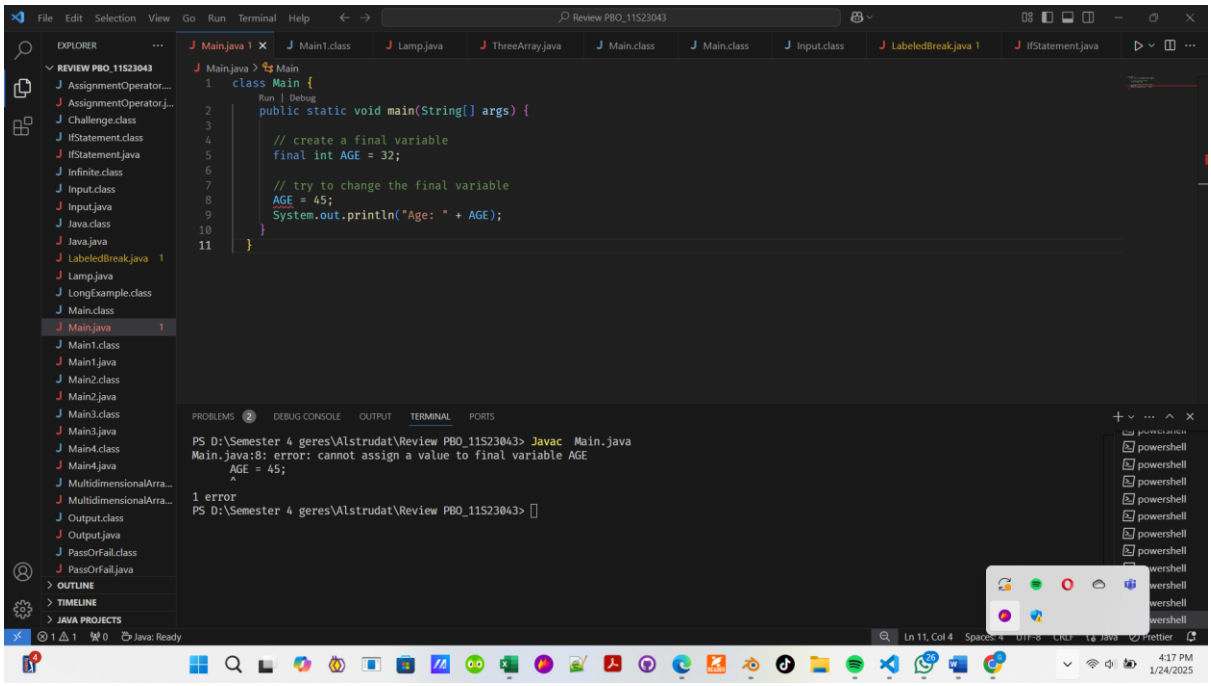


✓ Java this Keyword



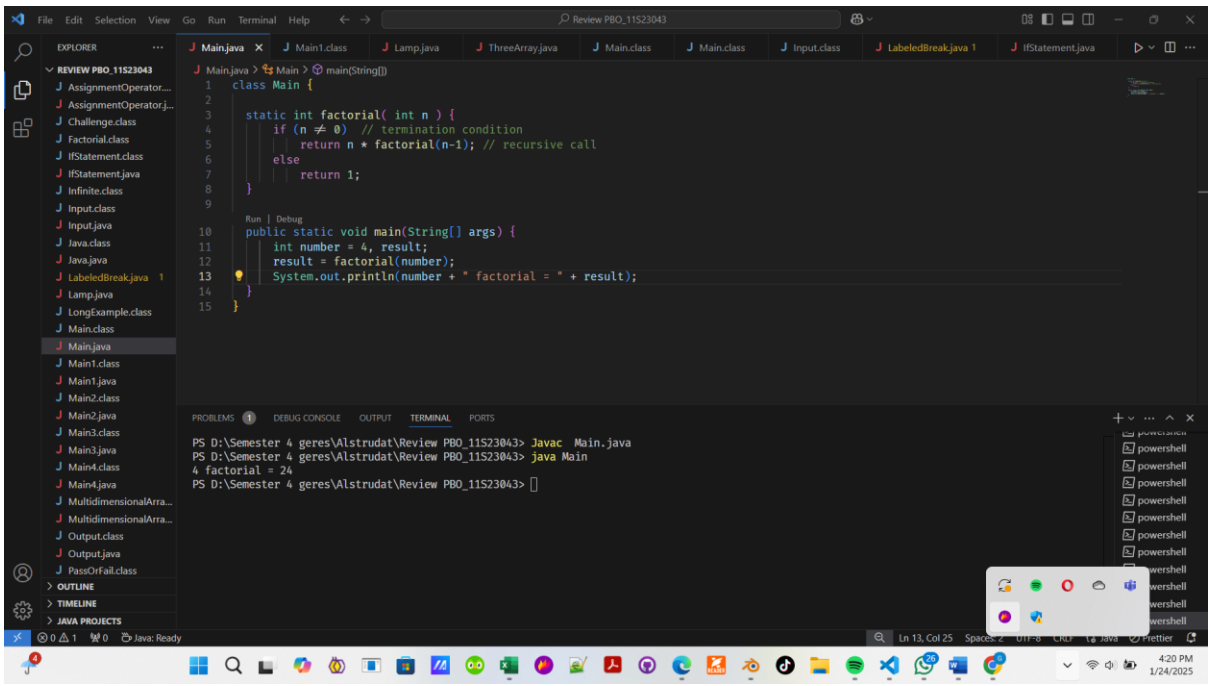
✓ Java final keyword

Java final Variable

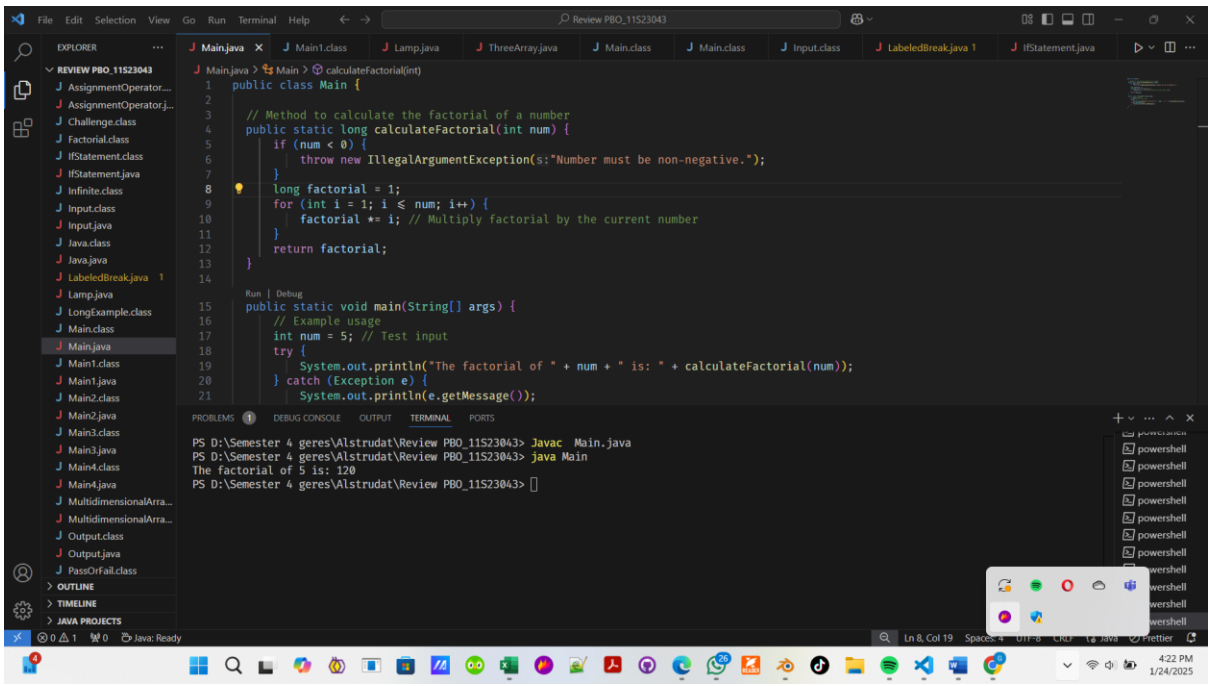


✓ Java Recursion

Factorial of a Number Using Recursion

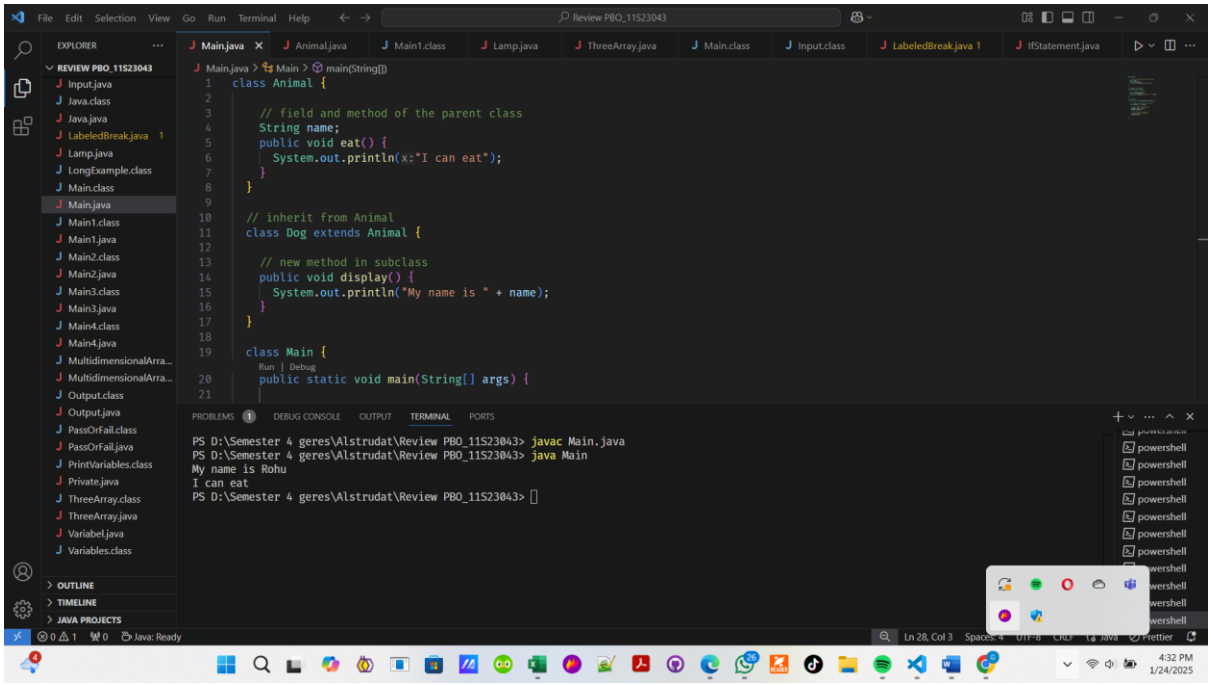


Challenge

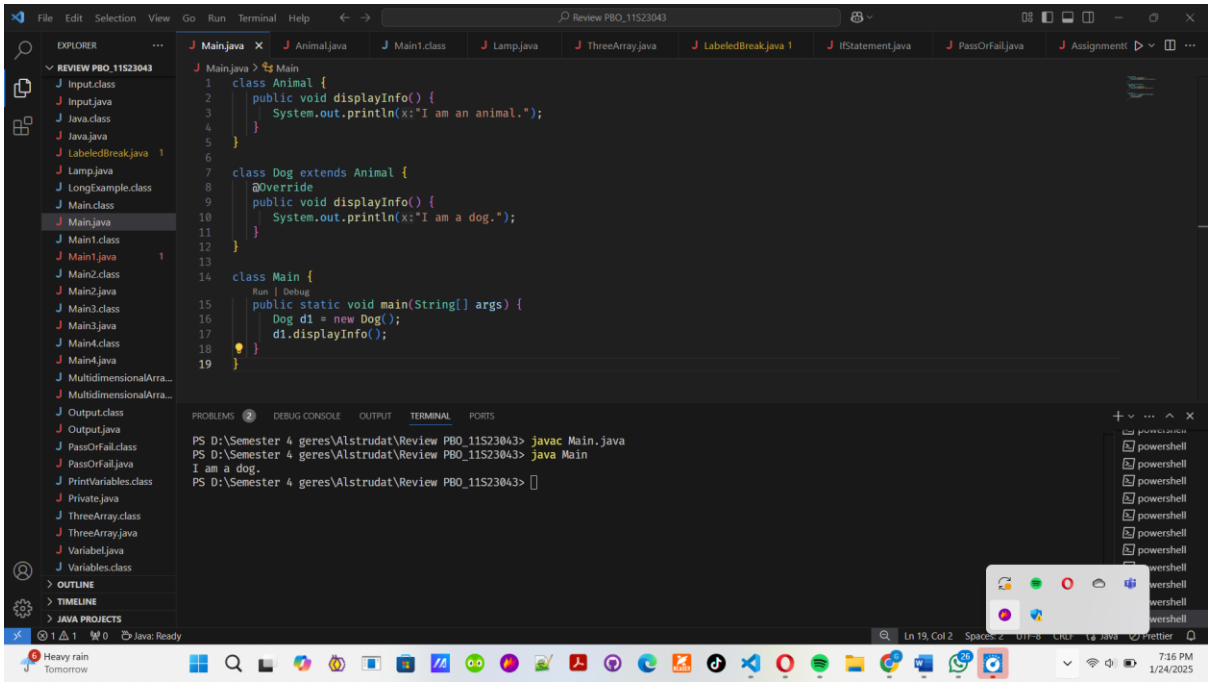


- **Java OOP(II)**

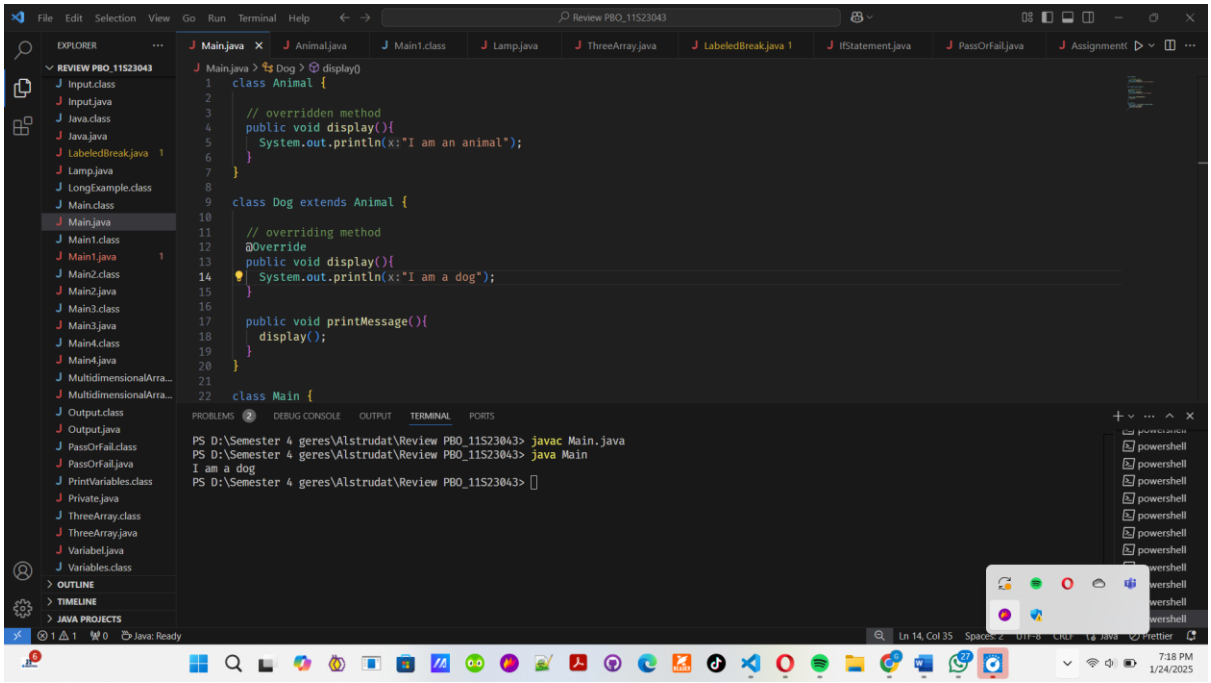
Java Inheritance



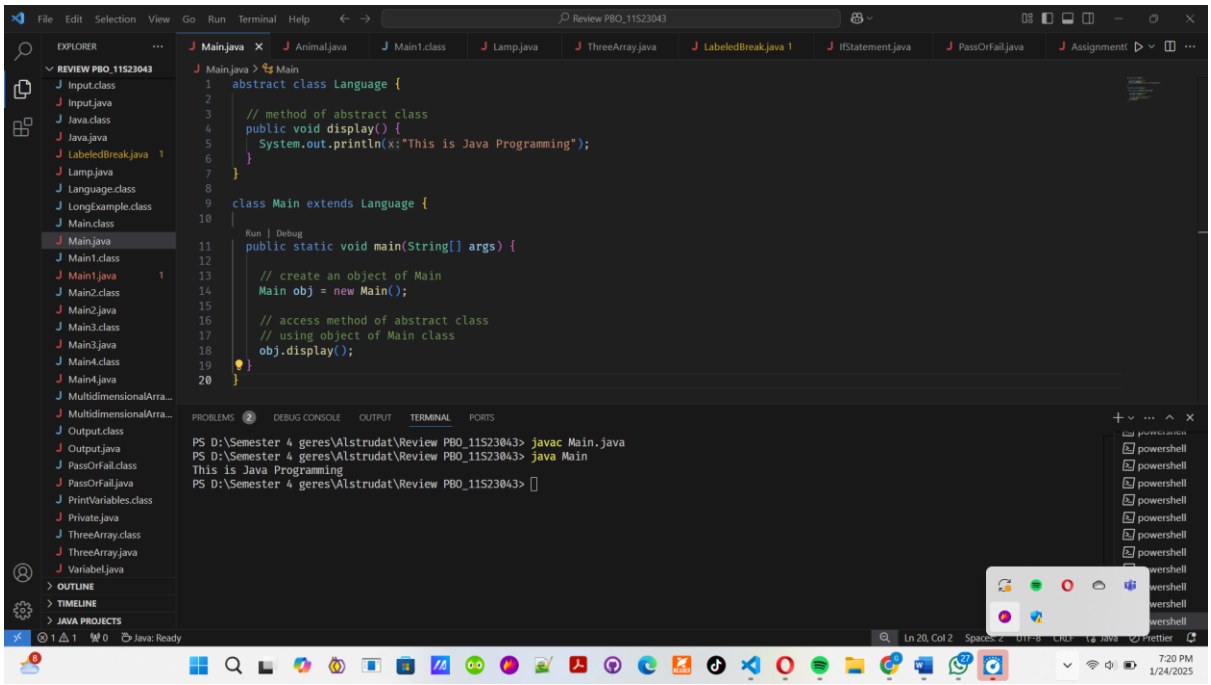
Method Overriding



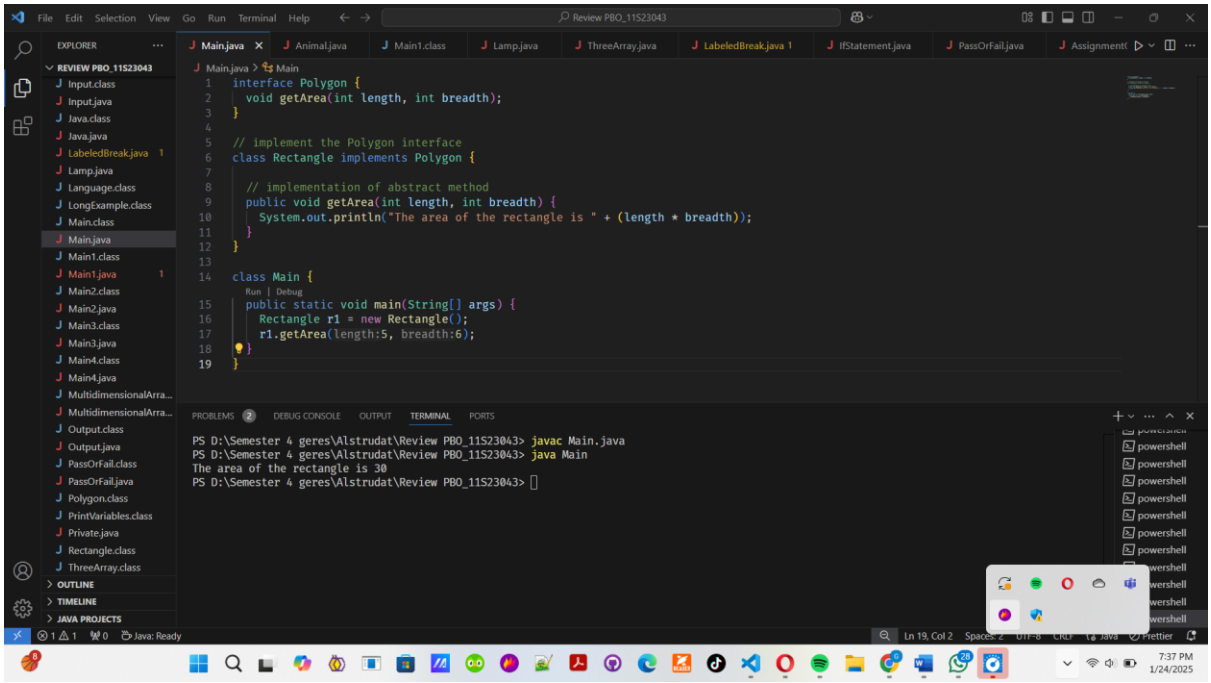
✓ **Java super**



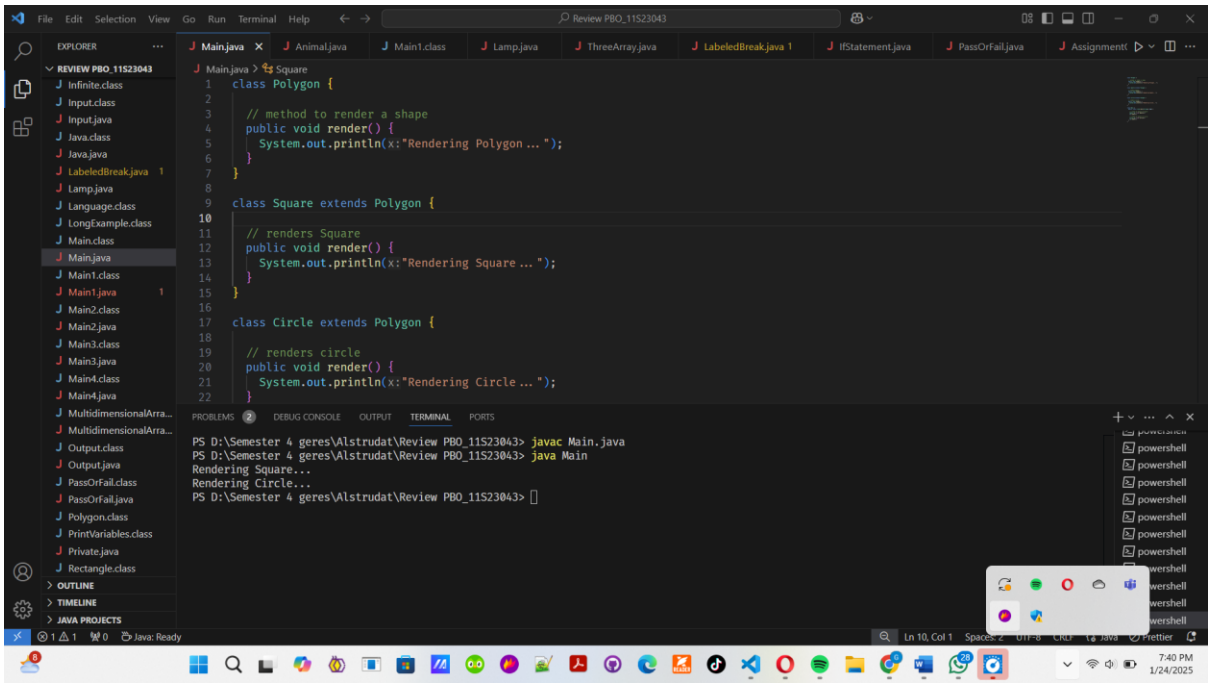
✓ **Java Abstract Class and Abstract Methods**



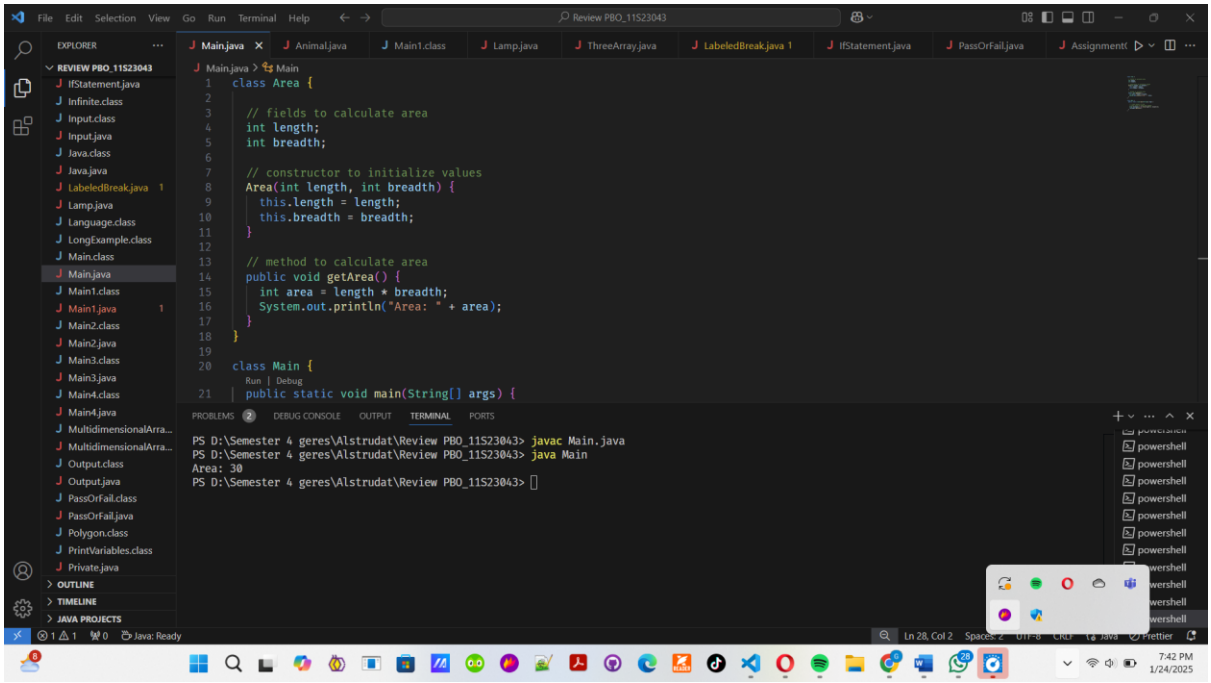
✓ **Java Interface**



✓ Java Polymorphism

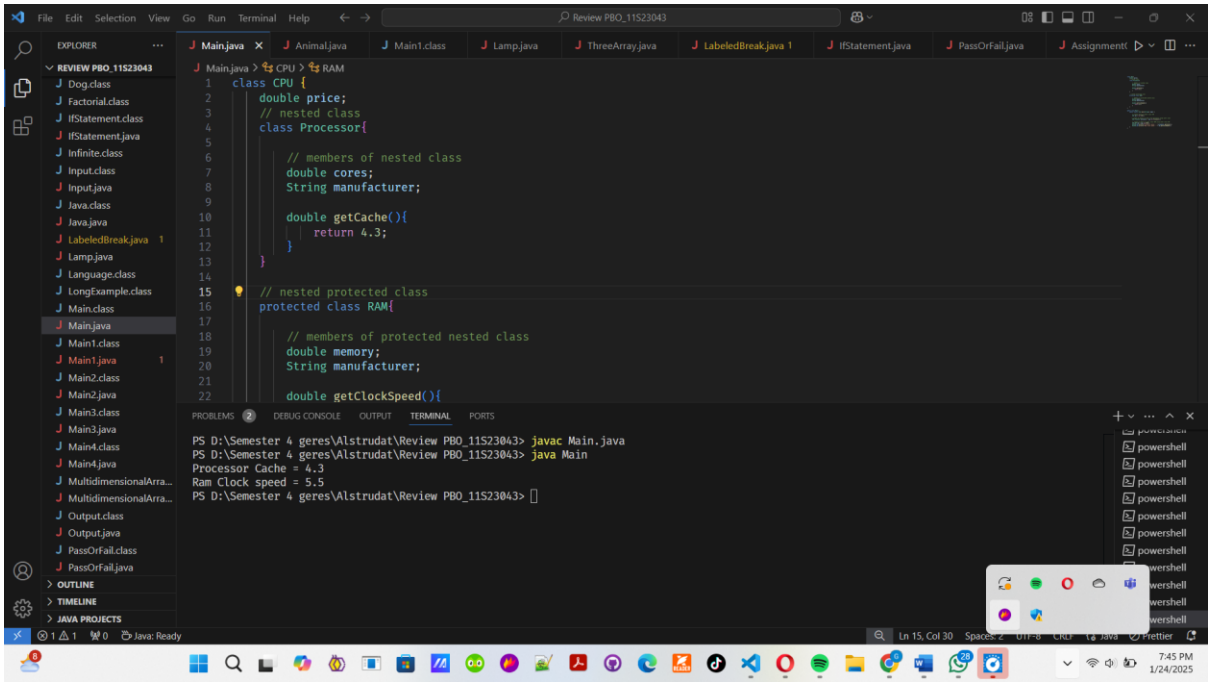


✓ Java Encapsulation

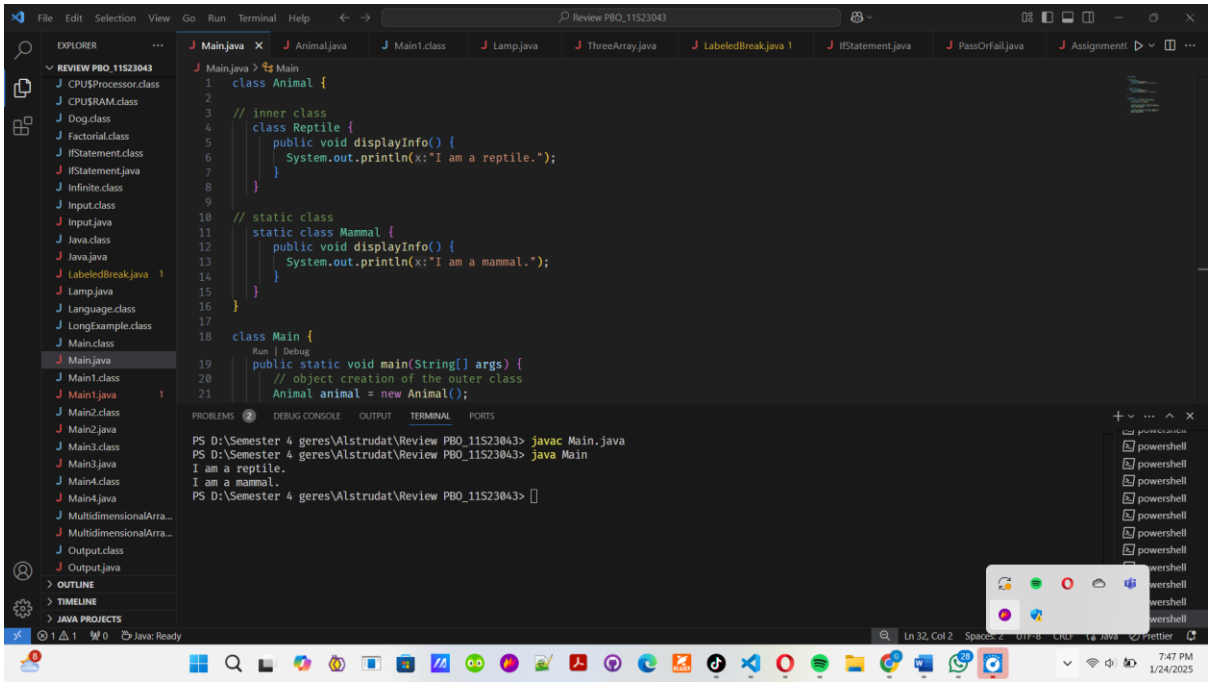


- **Java OOP(III)**

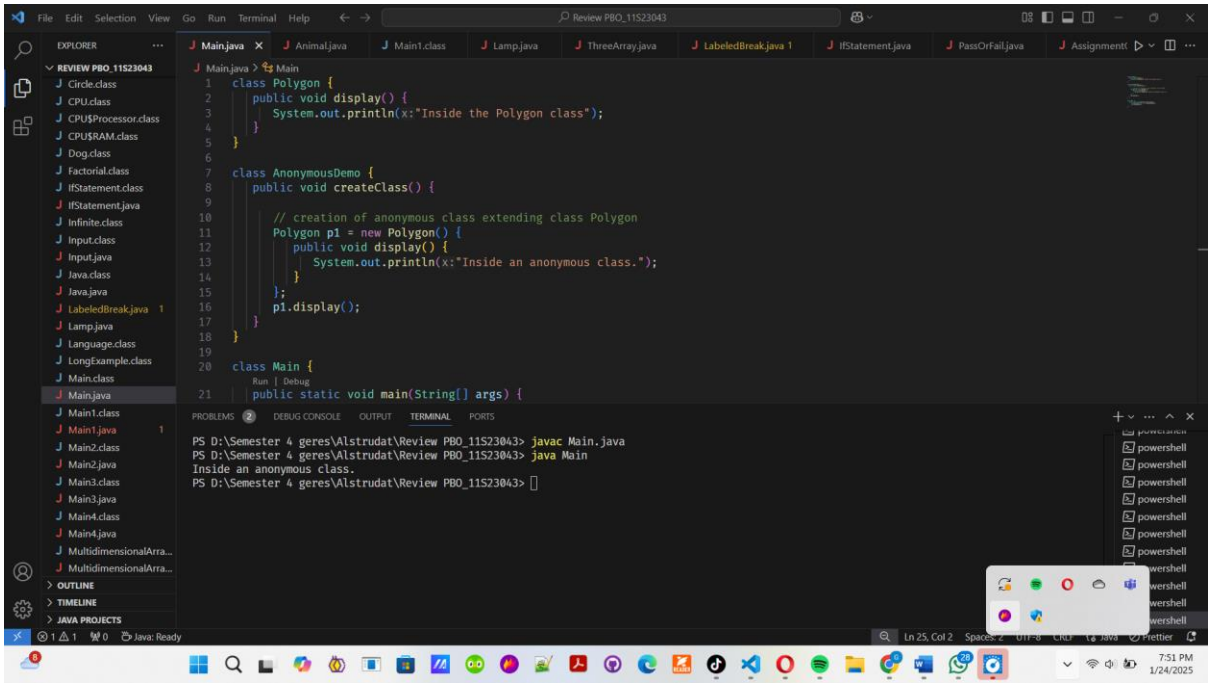
✓ **Java Nested and Inner Class**



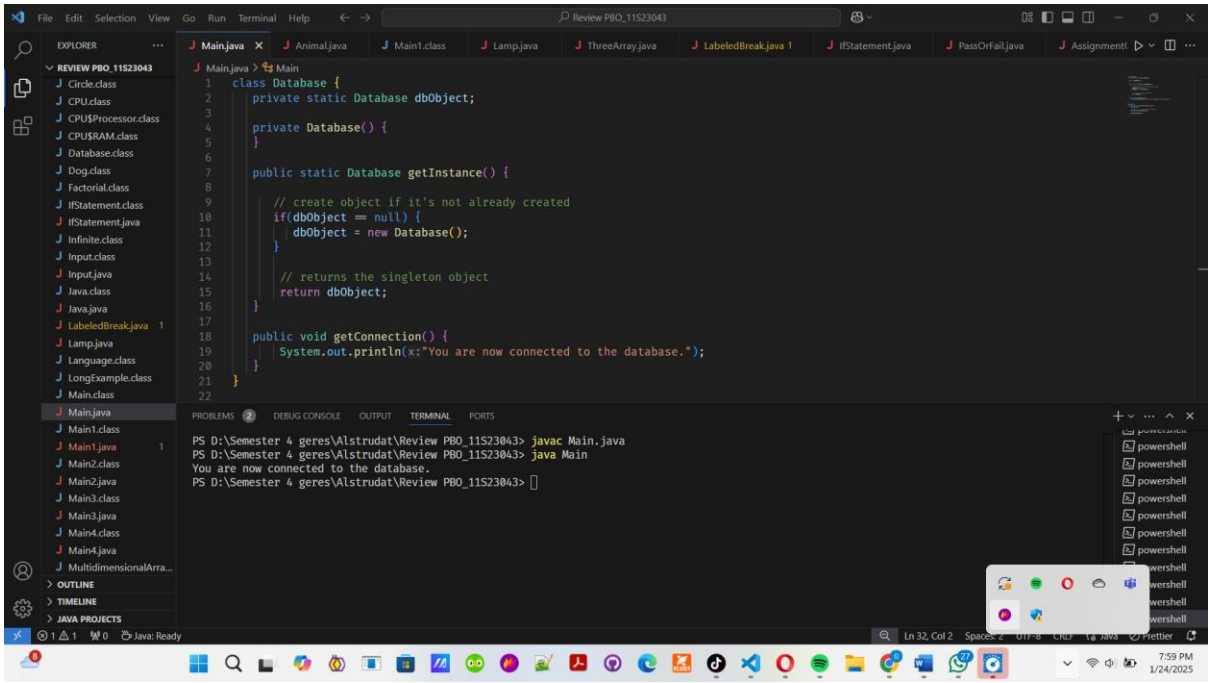
✓ Java Nested Static Class



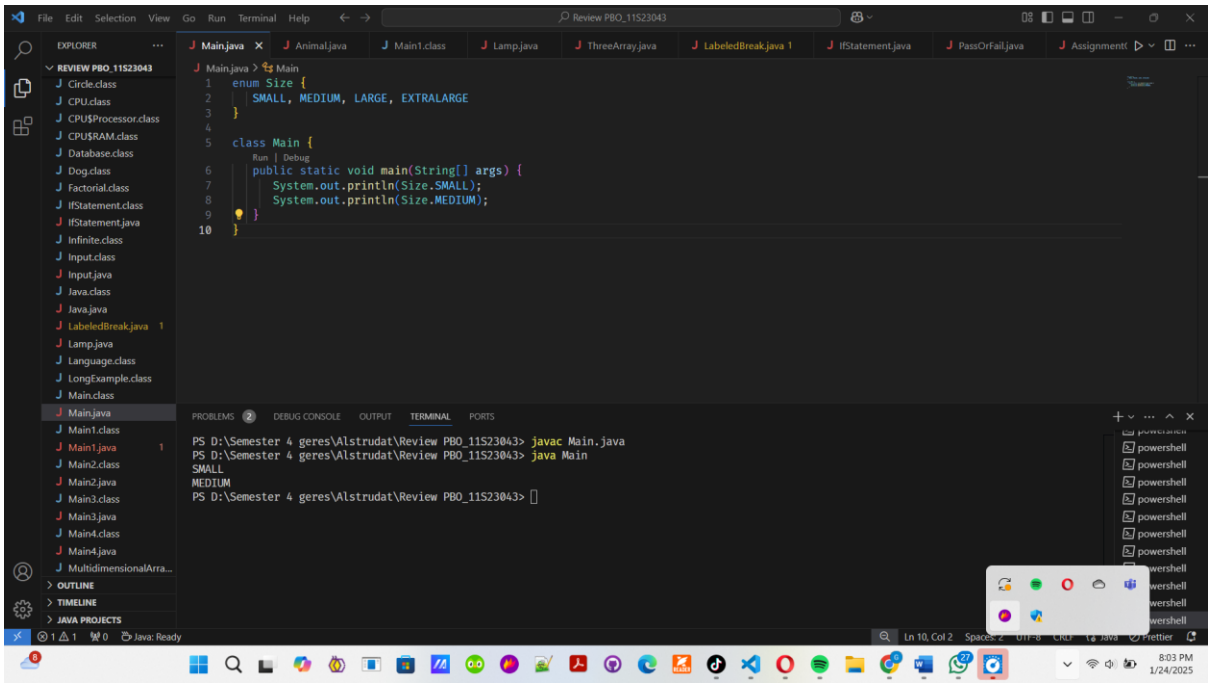
✓ Java Anonymous Class



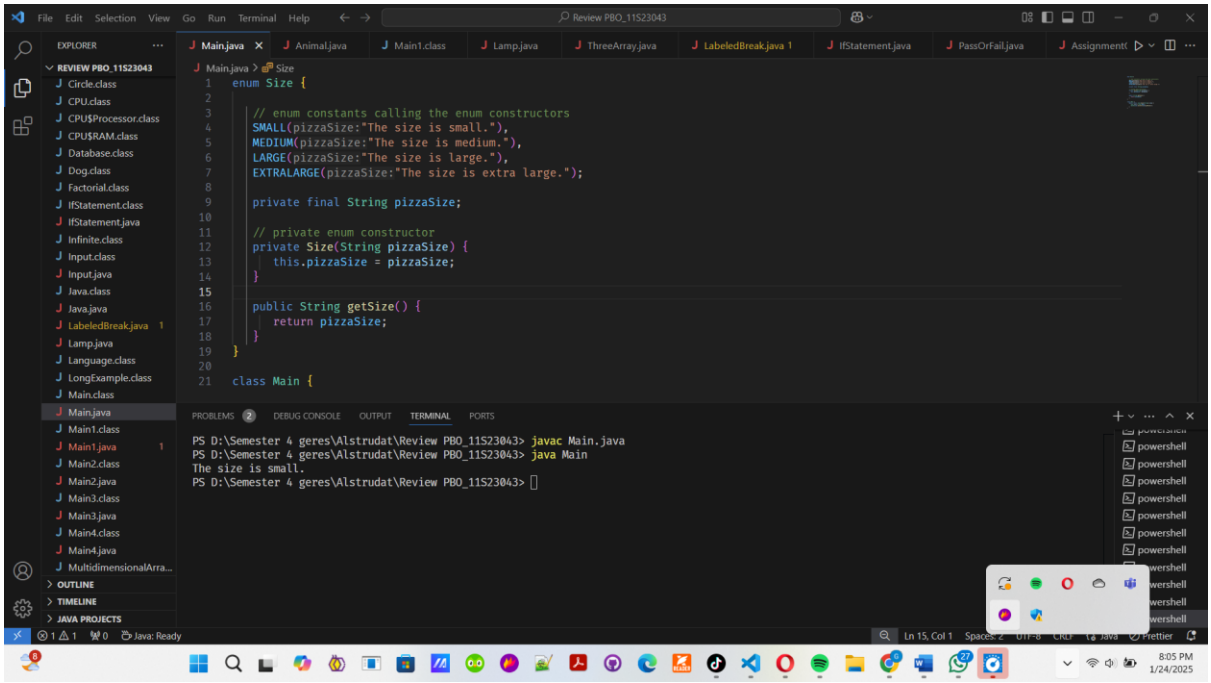
✓ Java Singleton Class



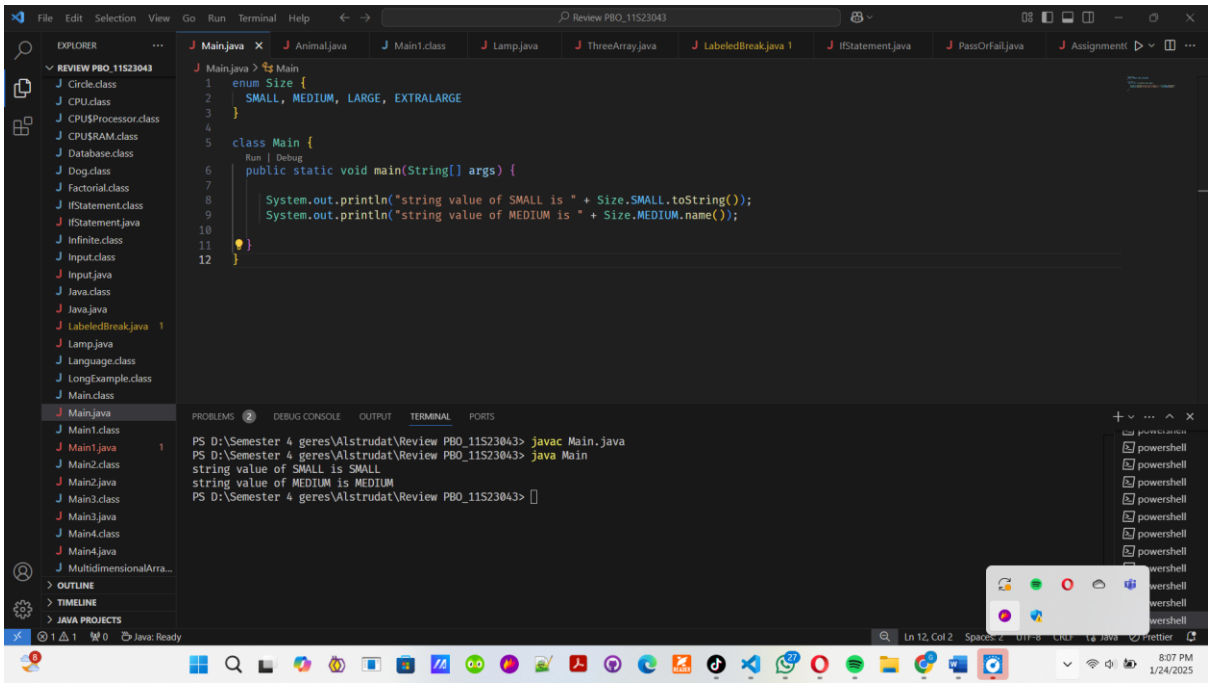
✓ Java enums



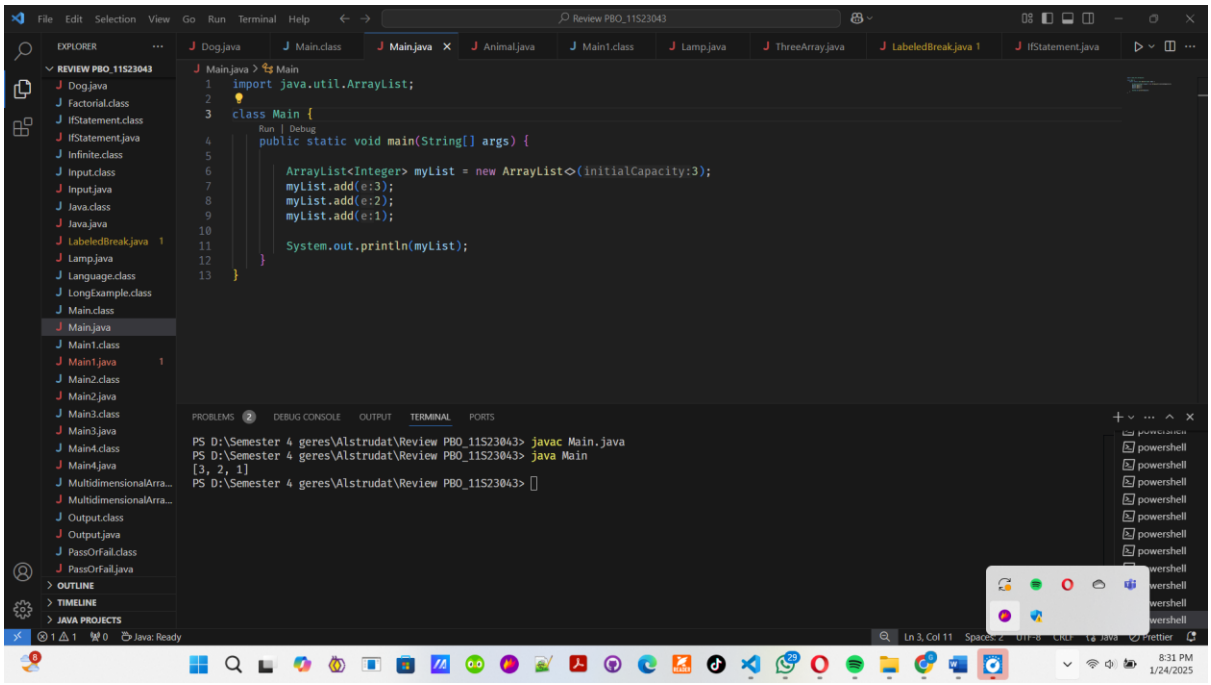
✓ Java enum Constructor



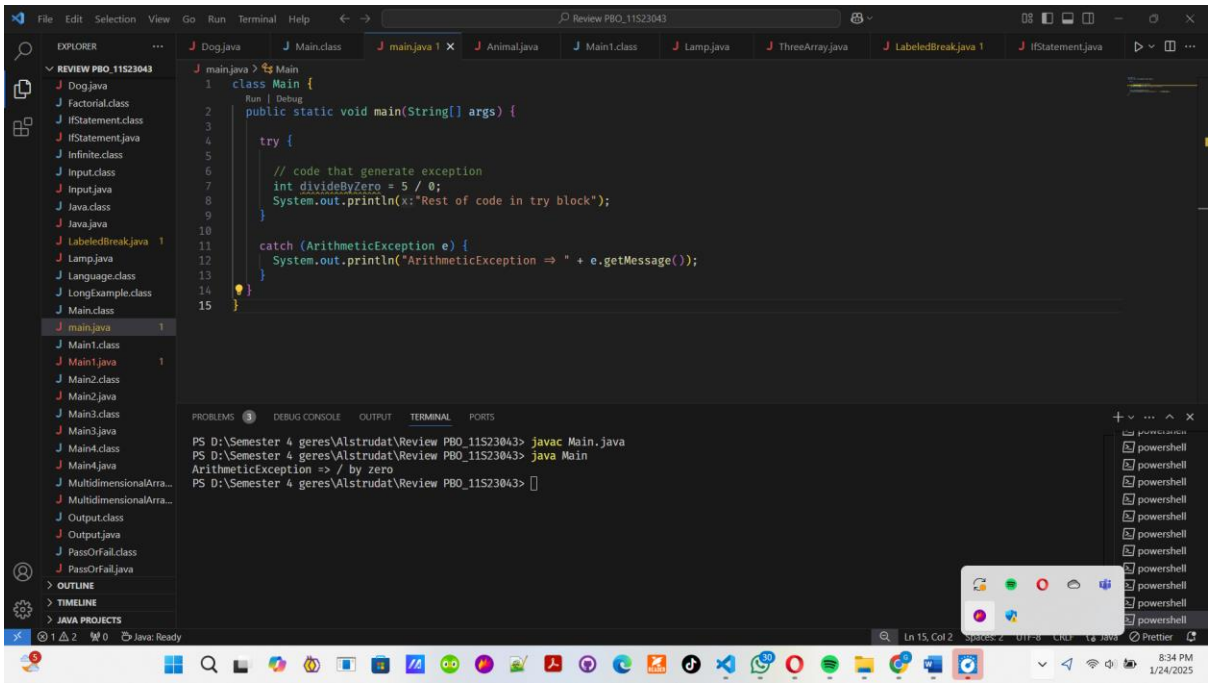
✓ Java enum Strings



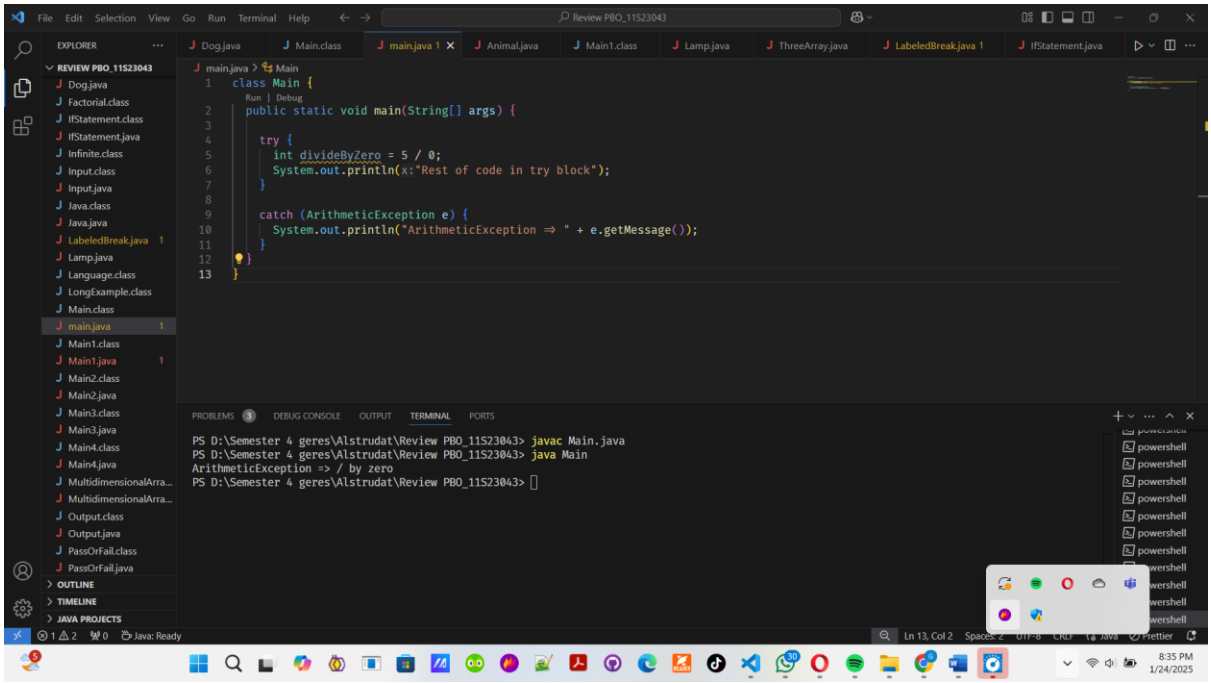
✓ **Java Package**



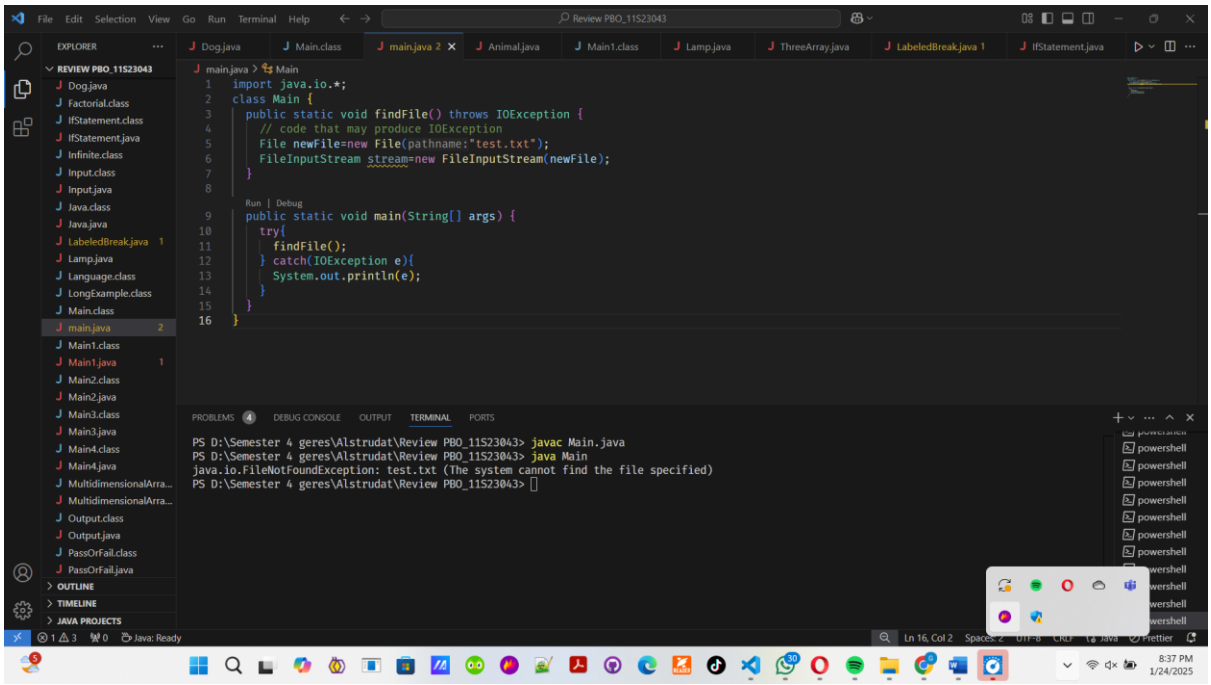
- **Java Exception Handling**



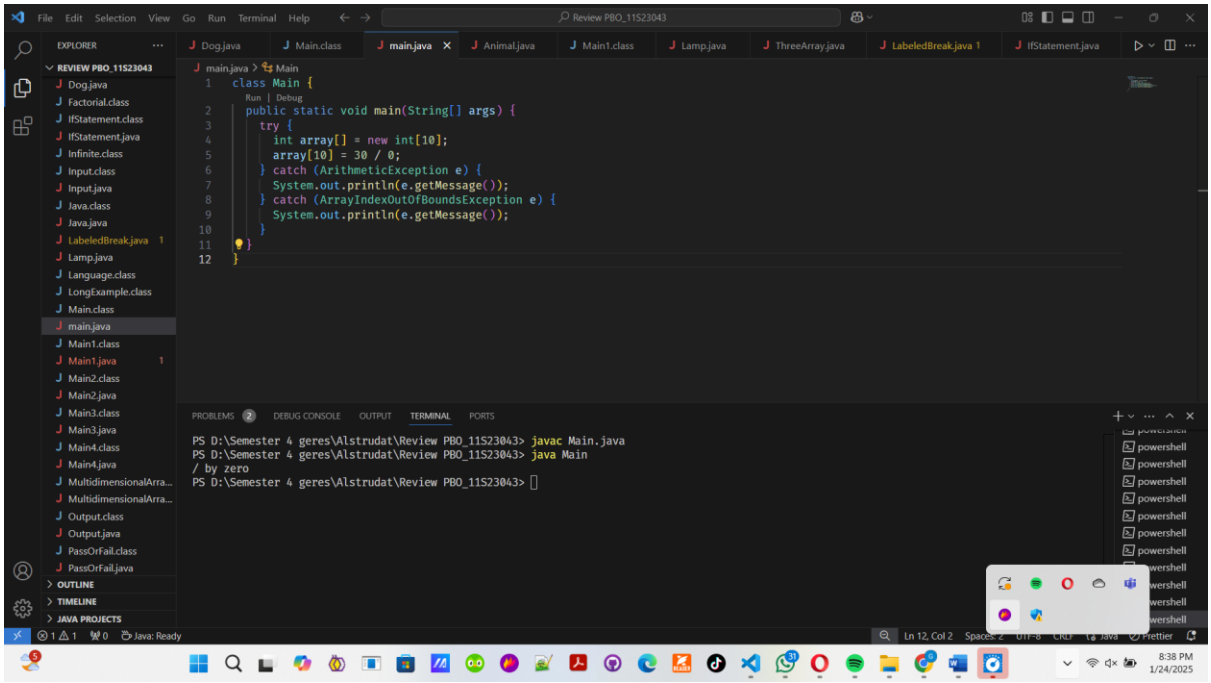
✓ **Java try...catch**



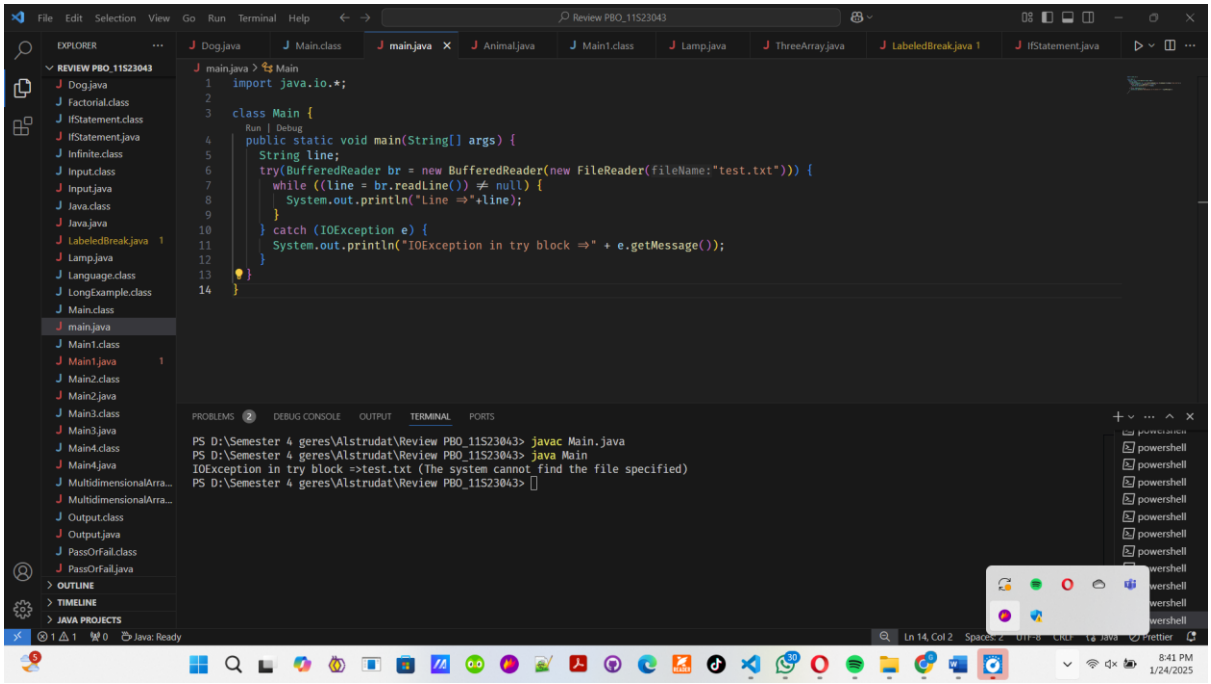
✓ **Java throw and throws**



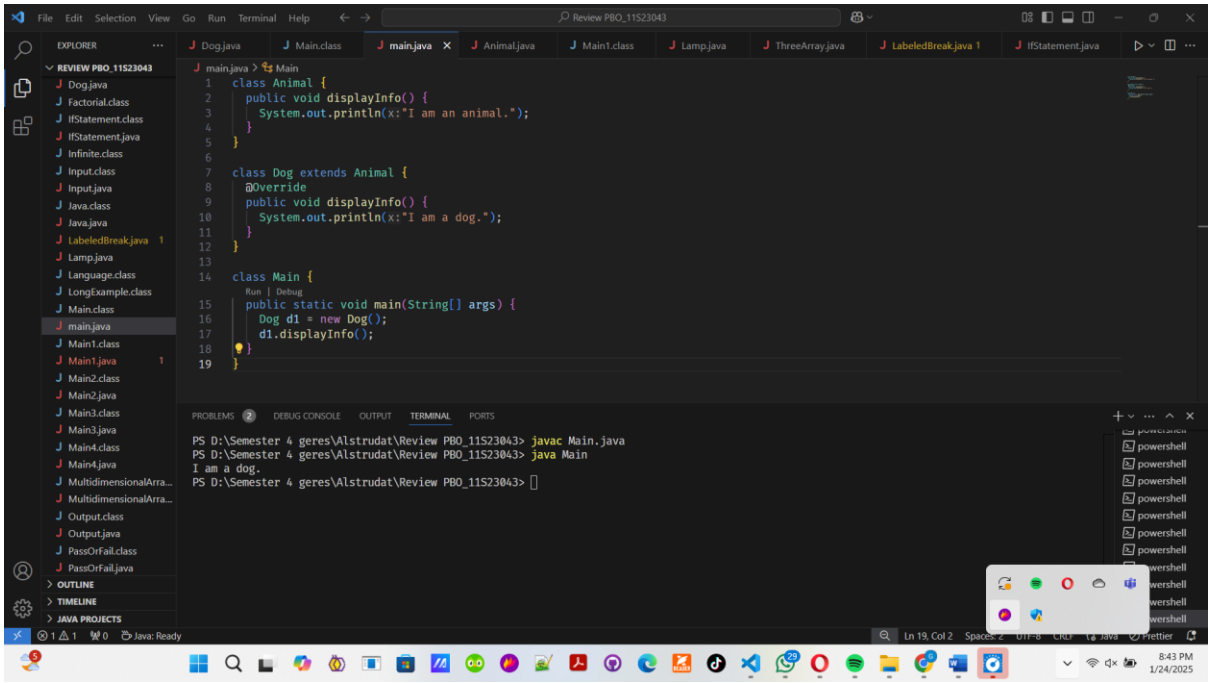
✓ Java catch Multiple Exceptions



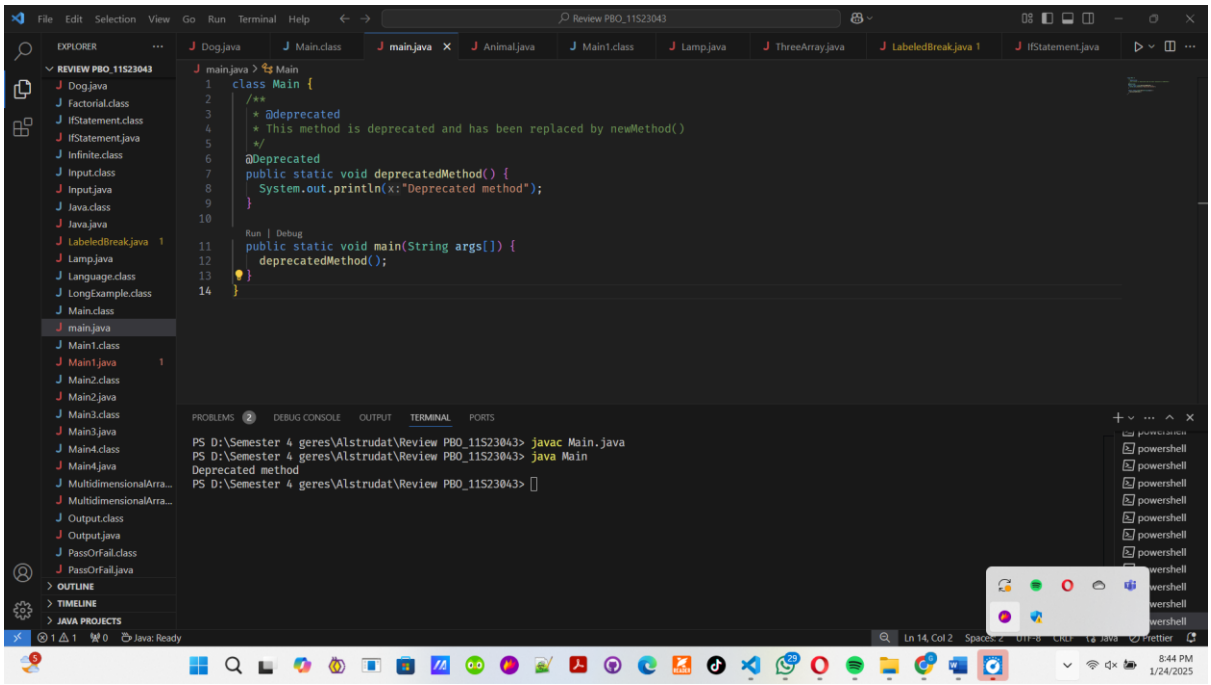
✓ Java try-with-resources



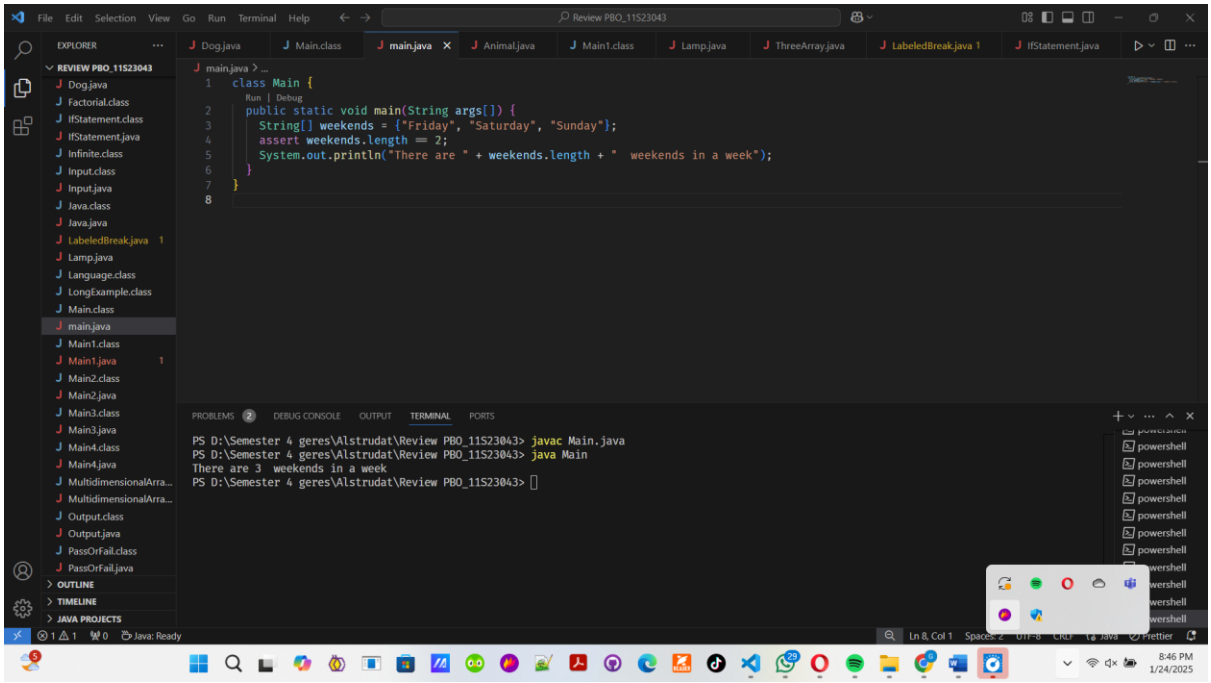
✓ Java Annotations



✓ Java Annotation Types

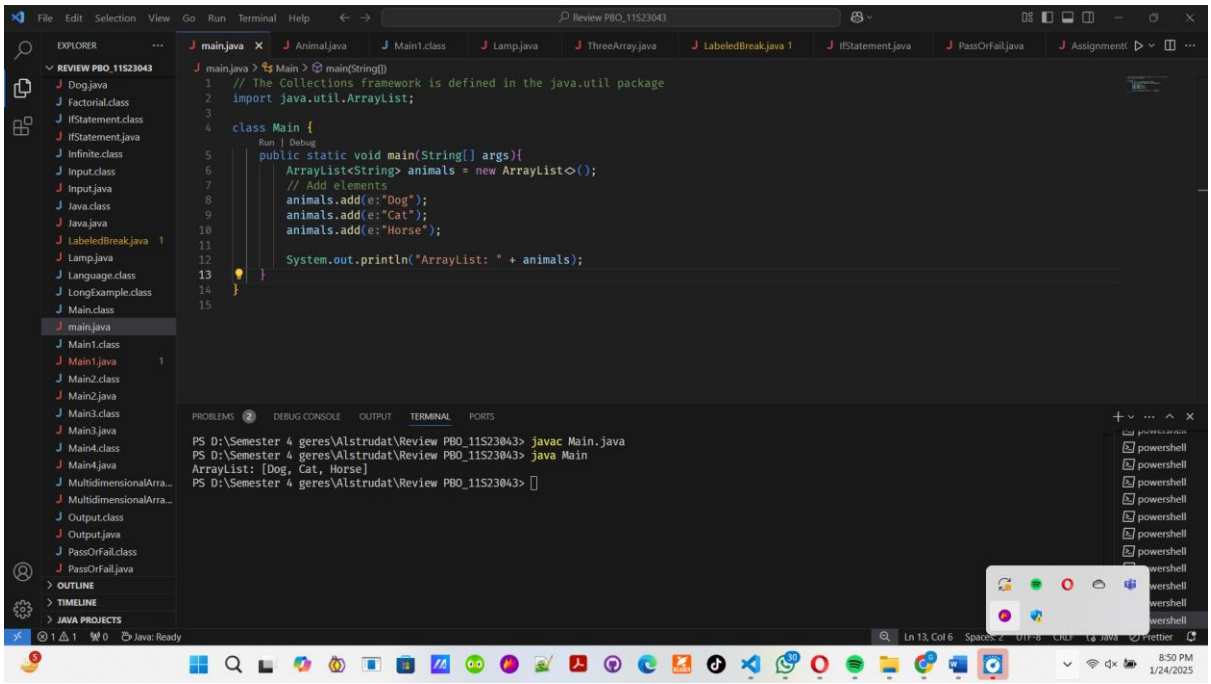


✓ **Java Assertions**

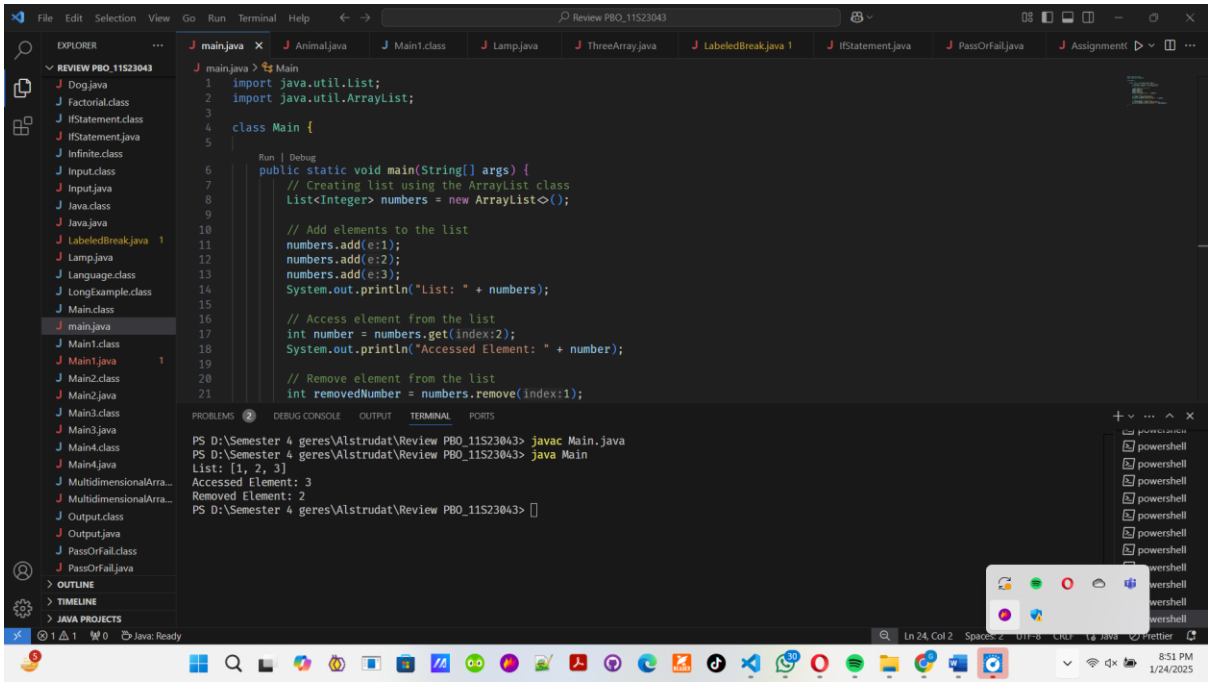


✓ **Java List**

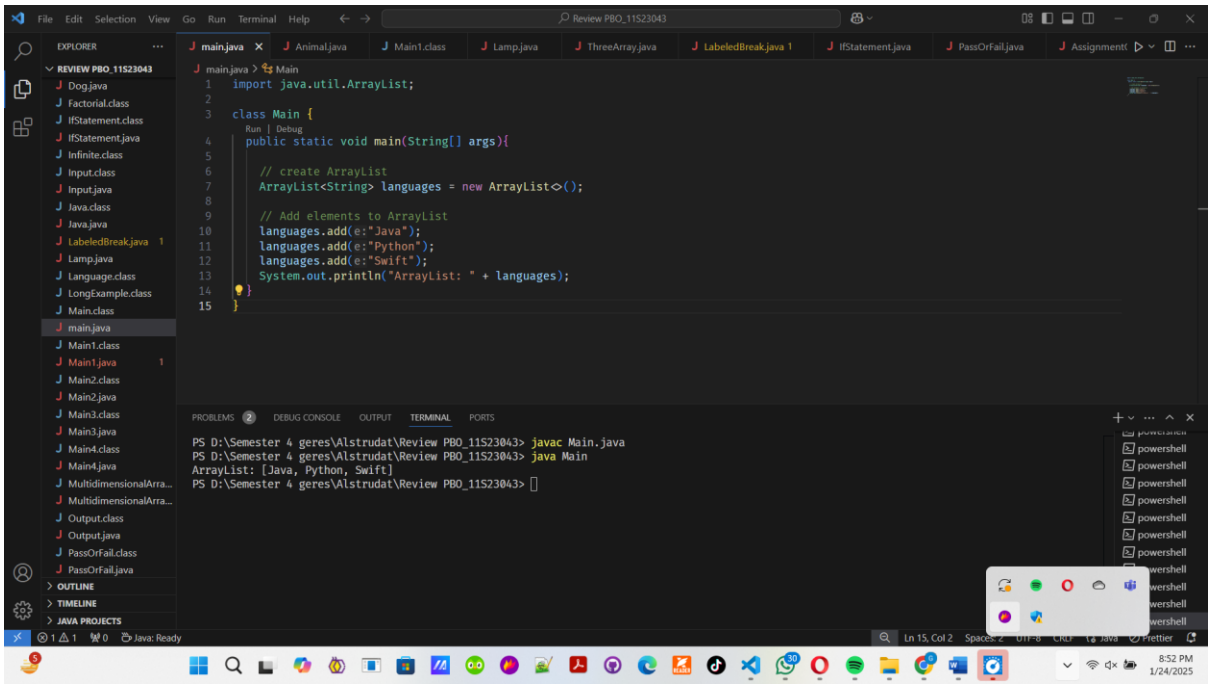
✓ **Java Collections Framework**



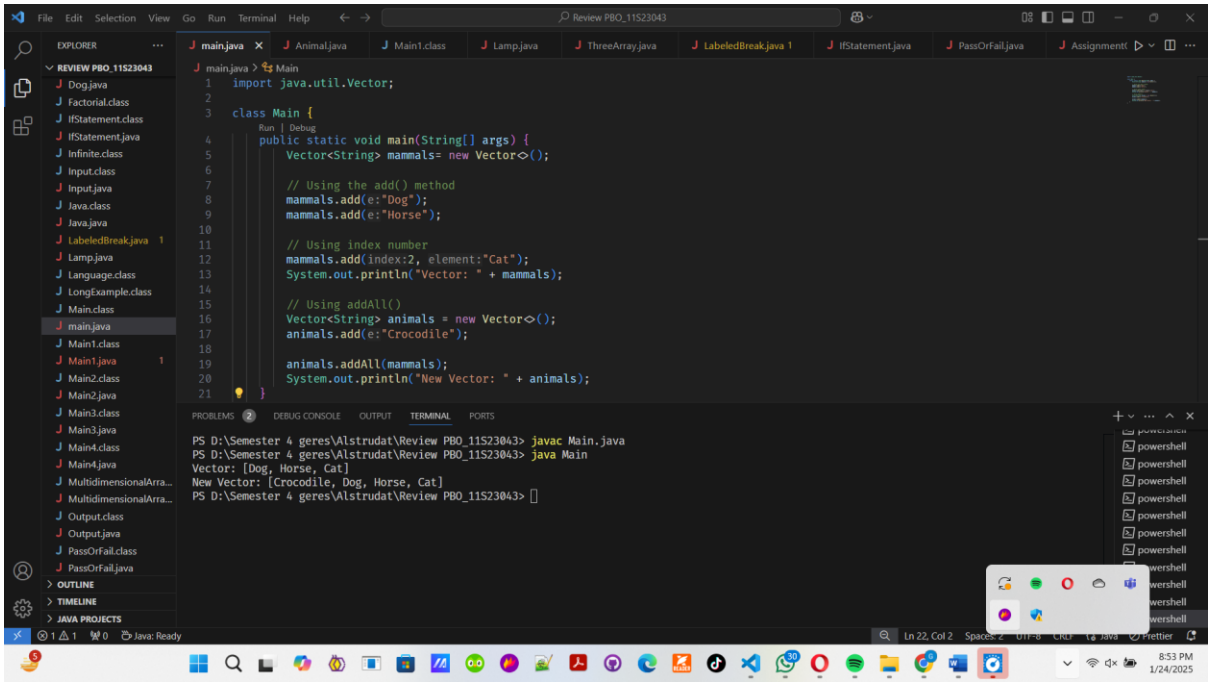
✓ Java List



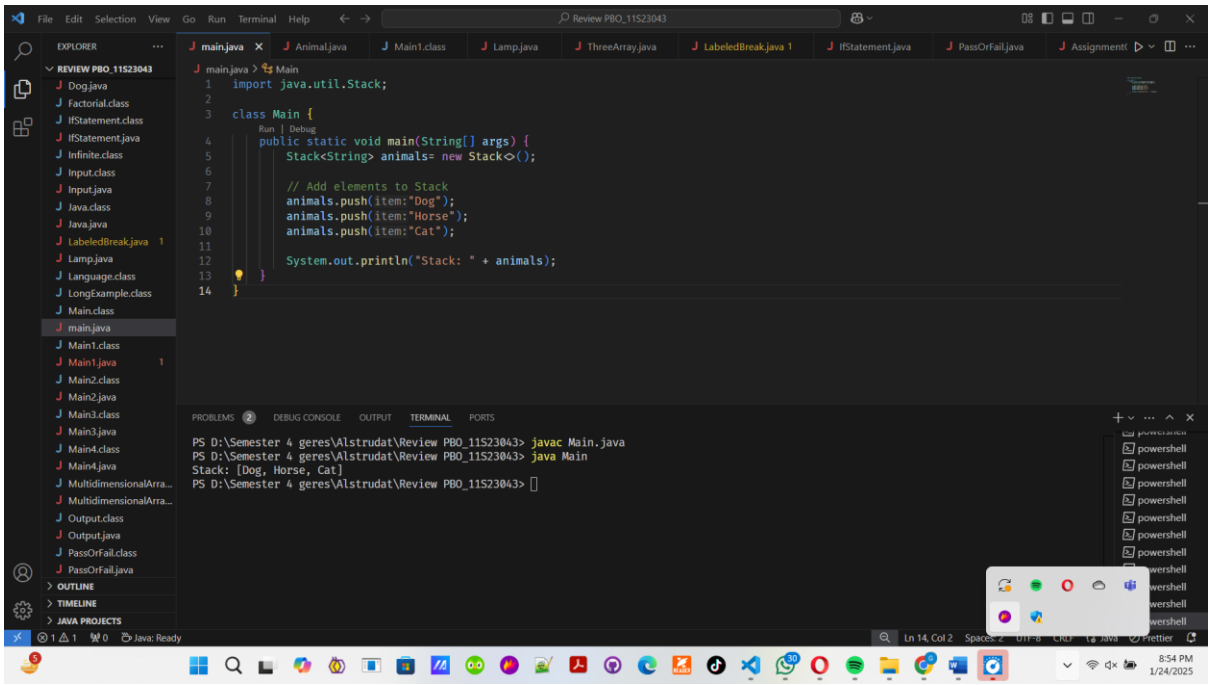
✓ Java ArrayList



✓ Java Vector



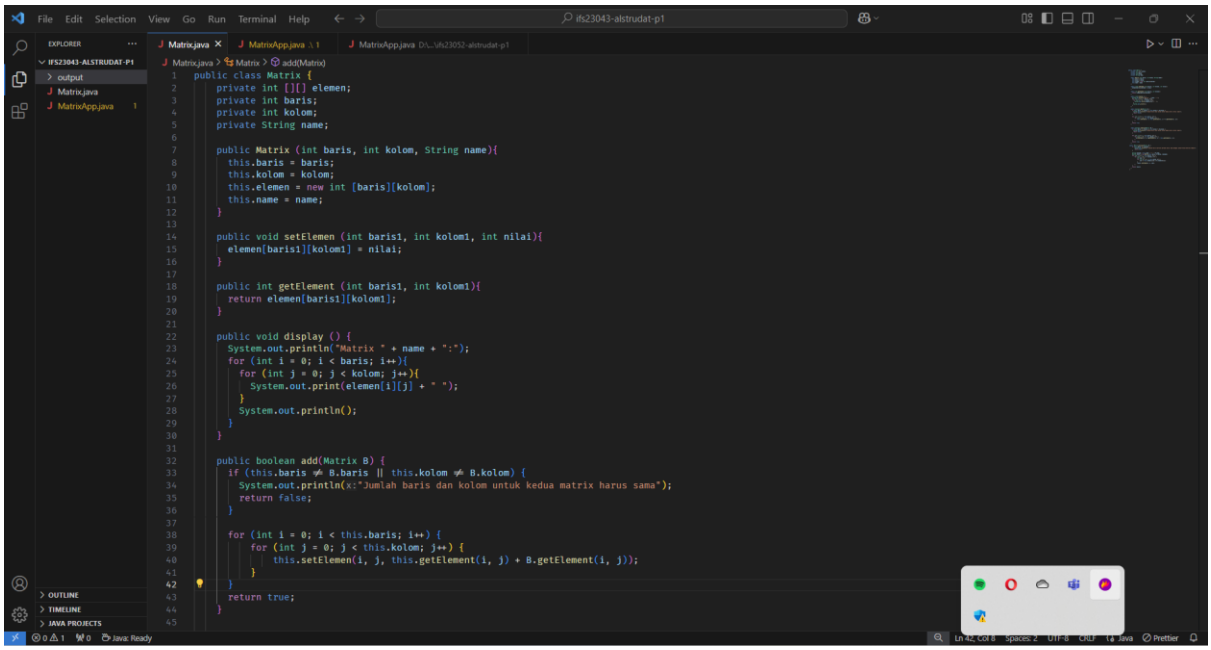
✓ Java Stack Class



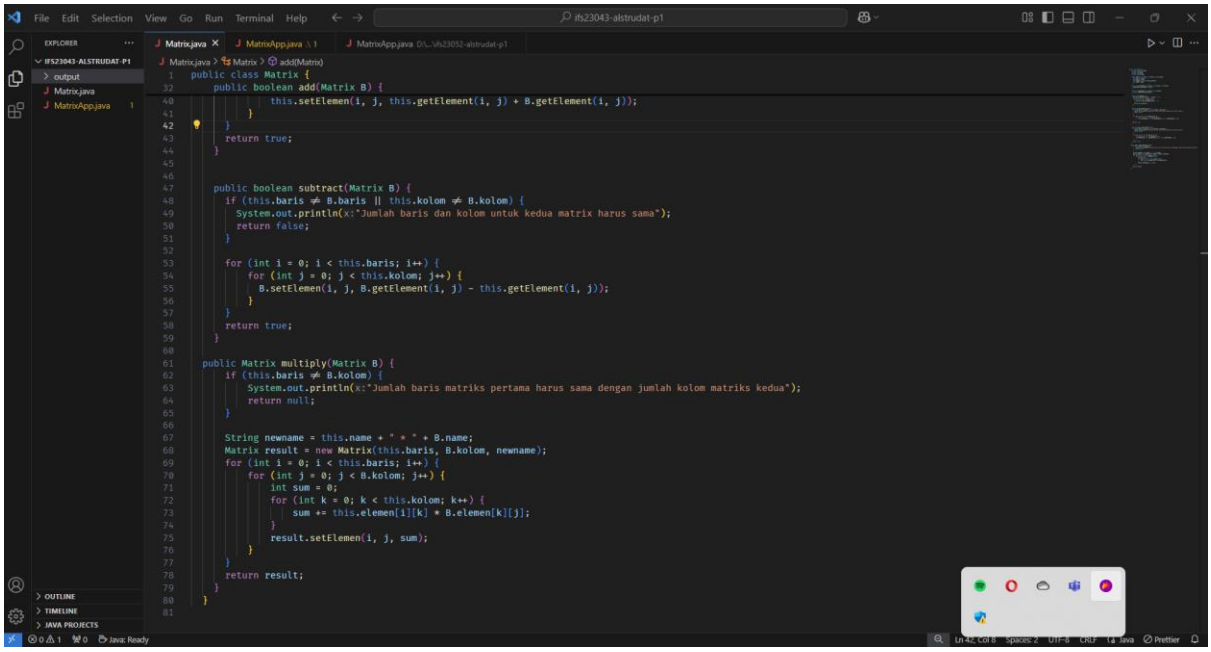
2. Studi Kasus 1: Matrix App

Buatlah kode program untuk matrix dengan operasi agar dapat menampilkan, menjumlahkan, mengurangkan dan mengalikan matrix. Program yang dibuat harus berada pada dua (2) file java yaitu Matrix.java dan MatrixApp.java, silahkan menggunakan perintah berikut untuk menjalankan kode program:

Matrix.java

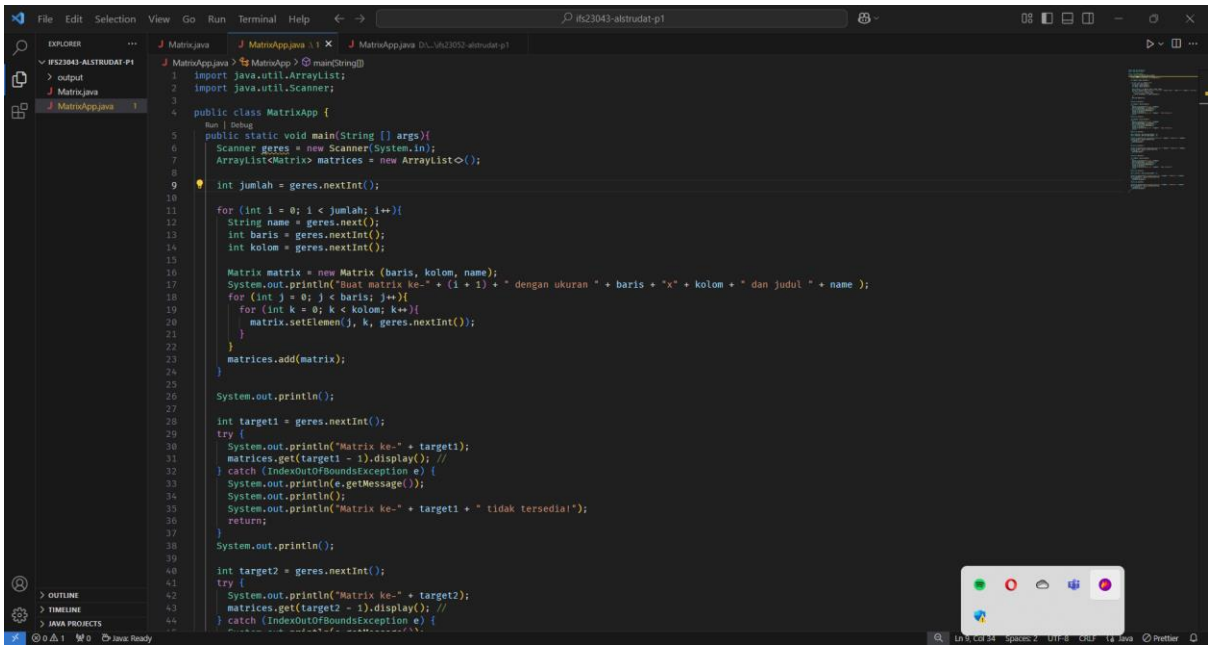


```java
public class Matrix {
    private int [][] elemen;
    private int baris;
    private int kolom;
    private String name;

    public Matrix (int baris, int kolom, String name){
      this.baris = baris;
      this.kolom = kolom;
      this.elemen = new int [baris][kolom];
      this.name = name;
    }

    public void setElemen (int baris1, int kolom1, int nilai){
      elemen[baris1][kolom1] = nilai;
    }

    public int getElement (int baris1, int kolom1){
      return elemen[baris1][kolom1];
    }

    public void display () {
      System.out.println("Matrix " + name + ":");
      for (int i = 0; i < baris; i++){
        for (int j = 0; j < kolom; j++){
          System.out.print(elemen[i][j] + " ");
        }
        System.out.println();
      }
    }

    public boolean add(Matrix B) {
      if (this.baris != B.baris || this.kolom != B.kolom) {
        System.out.println(x:"Jumlah baris dan kolom untuk kedua matrix harus sama");
        return false;
      }

      for (int i = 0; i < this.baris; i++) {
          for (int j = 0; j < this.kolom; j++) {
              this.setElemen(i, j, this.getElement(i, j) + B.getElement(i, j));
          }
      }
      return true;
    }
```

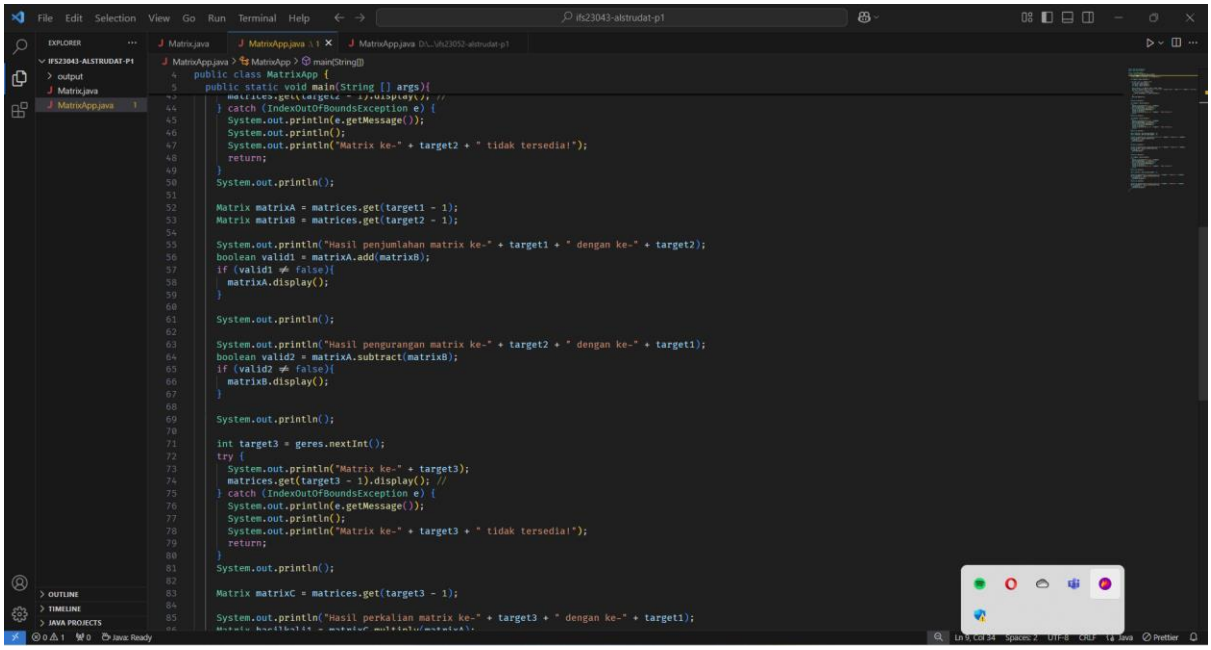


```java
    public boolean add(Matrix B) {
        for (int j = 0; j < this.kolom; j++) {
            this.setElemen(i, j, this.getElement(i, j) + B.getElement(i, j));
        }
      }
      return true;
    }

    public boolean subtract(Matrix B) {
      if (this.baris != B.baris || this.kolom != B.kolom) {
        System.out.println(x:"Jumlah baris dan kolom untuk kedua matrix harus sama");
        return false;
      }

      for (int i = 0; i < this.baris; i++) {
          for (int j = 0; j < this.kolom; j++) {
            B.setElemen(i, j, B.getElement(i, j) - this.getElement(i, j));
          }
      }
      return true;
    }

  public Matrix multiply(Matrix B) {
      if (this.baris != B.kolom) {
          System.out.println(x:"Jumlah baris matriks pertama harus sama dengan jumlah kolom matriks kedua");
          return null;
      }

      String newname = this.name + " * " + B.name;
      Matrix result = new Matrix(this.baris, B.kolom, newname);
      for (int i = 0; i < this.baris; i++) {
          for (int j = 0; j < B.kolom; j++) {
              int sum = 0;
              for (int k = 0; k < this.kolom; k++) {
                  sum += this.elemen[i][k] * B.elemen[k][j];
              }
              result.setElemen(i, j, sum);
          }
      }
      return result;
  }
}
```

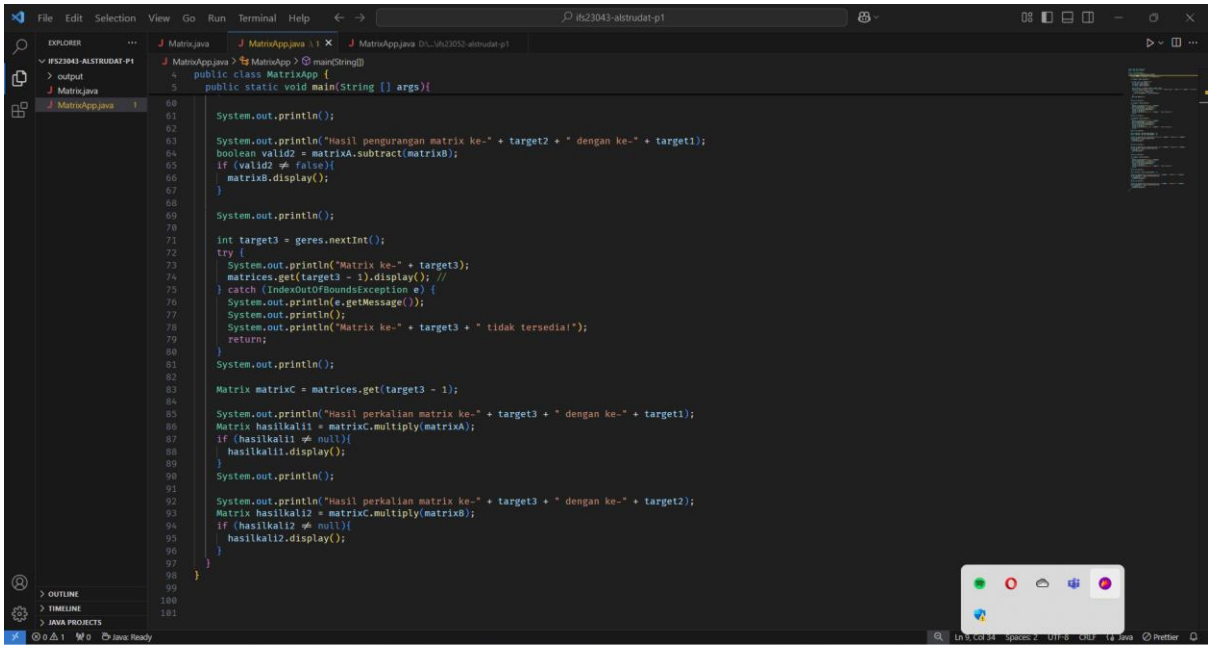
`MatrixApp.java`



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

public class MatrixApp {
  public static void main(String [] args){
    Scanner geres = new Scanner(System.in);
    ArrayList<Matrix> matrices = new ArrayList<>();

    int jumlah = geres.nextInt();

    for (int i = 0; i < jumlah; i++){
      String name = geres.next();
      int baris = geres.nextInt();
      int kolom = geres.nextInt();

      Matrix matrix = new Matrix (baris, kolom, name);
      System.out.println("Buat matrix ke-" + (i + 1) + " dengan ukuran " + baris + "x" + kolom + " dan judul " + name );
      for (int j = 0; j < baris; j++){
        for (int k = 0; k < kolom; k++){
          matrix.setElemen(j, k, geres.nextInt());
        }
      }
      matrices.add(matrix);
    }

    System.out.println();

    int target1 = geres.nextInt();
    try {
      System.out.println("Matrix ke-" + target1);
      matrices.get(target1 - 1).display(); //
    } catch (IndexOutOfBoundsException e) {
      System.out.println(e.getMessage());
      System.out.println();
      System.out.println("Matrix ke-" + target1 + " tidak tersedia!");
      return;
    }
    System.out.println();

    int target2 = geres.nextInt();
    try {
      System.out.println("Matrix ke-" + target2);
      matrices.get(target2 - 1).display(); //
    } catch (IndexOutOfBoundsException e) {
```

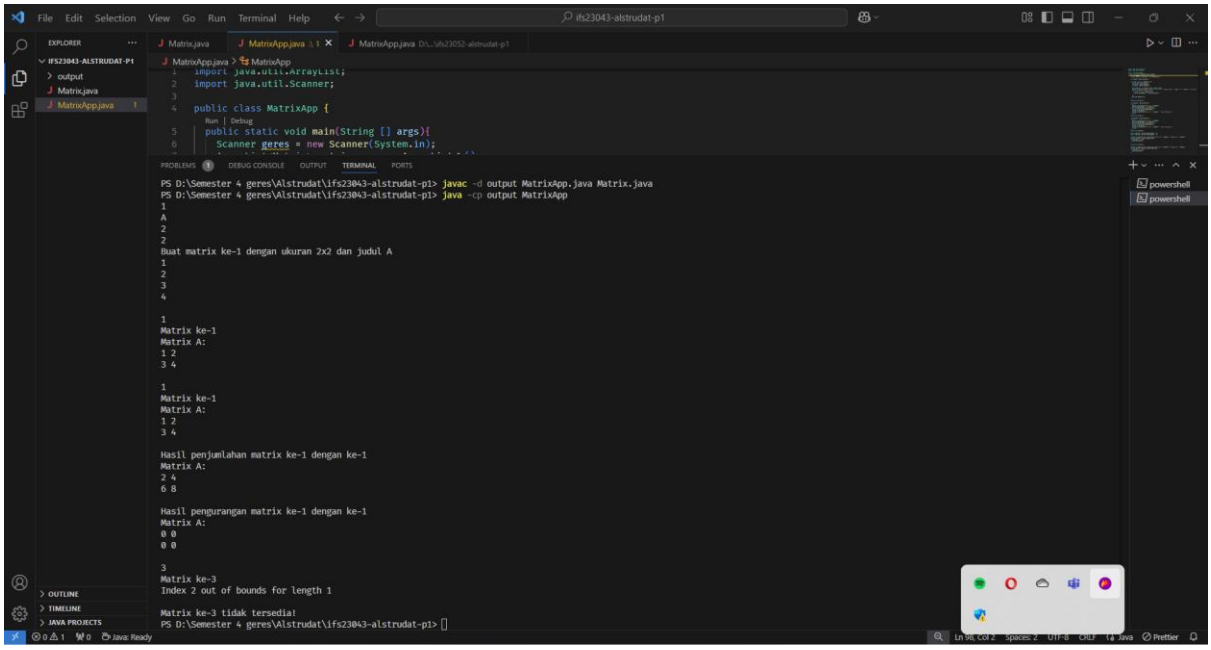


```java
    } catch (IndexOutOfBoundsException e) {
      System.out.println(e.getMessage());
      System.out.println();
      System.out.println("Matrix ke-" + target2 + " tidak tersedia!");
      return;
    }
    System.out.println();

    Matrix matrixA = matrices.get(target1 - 1);
    Matrix matrixB = matrices.get(target2 - 1);

    System.out.println("Hasil penjumlahan matrix ke-" + target1 + " dengan ke-" + target2);
    boolean valid1 = matrixA.add(matrixB);
    if (valid1 != false){
      matrixA.display();
    }

    System.out.println();

    System.out.println("Hasil pengurangan matrix ke-" + target2 + " dengan ke-" + target1);
    boolean valid2 = matrixA.subtract(matrixB);
    if (valid2 != false){
      matrixB.display();
    }

    System.out.println();

    int target3 = geres.nextInt();
    try {
      System.out.println("Matrix ke-" + target3);
      matrices.get(target3 - 1).display(); //
    } catch (IndexOutOfBoundsException e) {
      System.out.println(e.getMessage());
      System.out.println();
      System.out.println("Matrix ke-" + target3 + " tidak tersedia!");
      return;
    }
    System.out.println();

    Matrix matrixC = matrices.get(target3 - 1);

    System.out.println("Hasil perkalian matrix ke-" + target3 + " dengan ke-" + target1);
```



```
    System.out.println();

    System.out.println("Hasil pengurangan matrix ke-" + target2 + " dengan ke-" + target1);
    boolean valid2 = matrixA.subtract(matrix8);
    if (valid2 != false){
      matrix8.display();
    }

    System.out.println();

    int target3 = geres.nextInt();
    try {
      System.out.println("Matrix ke-" + target3);
      matrices.get(target3 - 1).display(); //
    } catch (IndexOutOfBoundsException e) {
      System.out.println(e.getMessage());
      System.out.println();
      System.out.println("Matrix ke-" + target3 + " tidak tersedia!");
      return;
    }
    System.out.println();

    Matrix matrixC = matrices.get(target3 - 1);

    System.out.println("Hasil perkalian matrix ke-" + target3 + " dengan ke-" + target1);
    Matrix hasilkali1 = matrixC.multiply(matrixA);
    if (hasilkali1 != null){
      hasilkali1.display();
    }
    System.out.println();

    System.out.println("Hasil perkalian matrix ke-" + target3 + " dengan ke-" + target2);
    Matrix hasilkali2 = matrixC.multiply(matrix8);
    if (hasilkali2 != null){
      hasilkali2.display();
    }
  }
}
```

Contoh program saat dijalankan:



```
PS D:\Semester 4 geres\Alstrudat\ifs23043-alstrudat-p1> javac -d output MatrixApp.java Matrix.java
PS D:\Semester 4 geres\Alstrudat\ifs23043-alstrudat-p1> java -cp output MatrixApp
1
A
2
2
Buat matrix ke-1 dengan ukuran 2x2 dan judul A
1
2
3
4

1
Matrix ke-1
Matrix A:
1 2
3 4

1
Matrix ke-1
Matrix A:
1 2
3 4

Hasil penjumlahan matrix ke-1 dengan ke-1
Matrix A:
2 4
6 8

Hasil pengurangan matrix ke-1 dengan ke-1
Matrix A:
0 0
0 0

3
Matrix ke-3
Index 2 out of bounds for length 1

Matrix ke-3 tidak tersedia!
PS D:\Semester 4 geres\Alstrudat\ifs23043-alstrudat-p1>
```