LAB 5

Program that randomly generates complex numbers and performs operations (+, -, *, /) on them.

Definitions

java.util.Random – It is a library that contains methods to generate random integers, doubles, etc. We use it by initializing an object of type random

Random rand = new Random();

We can then use this object to generate random numbers by calling methods of the Random class.

rand.nextDouble() – This method generates a random number. We specify the range by passing it as a parameter. For instance if we want a random number < 100, we call

rand.nextDouble(100);

We can assign this to a double variable and use it in the future.

Code

```
/* Program to randomly generate
   complex numbers and perform
   operations on them */

import java.util.Random;

class Complex {
    private double Re, Im;
    Random rand = new Random();

    public Complex() {
        Re = rand.nextDouble(100);
        Im = rand.nextDouble(100);
    }

    public void printComplex() {
        System.out.printf("%.2f + %.2fi", this.Re, this.Im);
    }

    public static void sum(Complex A, Complex B) {
        Complex C = new Complex();
        C.Re = A.Re + B.Re;
        C.Im = A.Im + B.Im;
```

```
        System.out.print("(");
        A.printComplex();
        System.out.print(") + (");
        B.printComplex();
        System.out.print(") = ");

        C.printComplex();
    }

    public static void difference(Complex A, Complex B) {
        Complex C = new Complex();
        C.Re = A.Re - B.Re;
        C.Im = A.Im - B.Im;

        System.out.print("(");
        A.printComplex();
        System.out.print(") - (");
        B.printComplex();
        System.out.print(") = ");

        C.printComplex();
    }

    public static void product(Complex A, Complex B) {
        Complex C = new Complex();
        C.Re = A.Re * B.Re - A.Im * B.Im;
        C.Im = A.Re * B.Im - B.Re * A.Im;

        System.out.print("(");
        A.printComplex();
        System.out.print(") * (");
        B.printComplex();
        System.out.print(") = ");

        C.printComplex();
    }

    public static void quotient(Complex A, Complex B) {
        Complex C = new Complex();
        C.Re = (A.Re * B.Re - A.Im * B.Im) / (B.Re * B.Re + B.Im * B.Im);
        C.Im = (A.Re * B.Im + A.Im * B.Re) / (B.Re * B.Re + B.Im * B.Im);

        System.out.print("(");
        A.printComplex();
        System.out.print(") / (");
        B.printComplex();
        System.out.print(") = ");

        C.printComplex();
    }
}
```

```java
public class Lab5 {
    public static void main(String[] args) {

        //Creating 2 random complex numbers
        Complex C1 = new Complex();
        C1.printComplex();
        System.out.println();

        Complex C2 = new Complex();
        C2.printComplex();
        System.out.println();
        System.out.println();

        //Performing operations on them
        Complex.sum(C1, C2);
        System.out.println();

        Complex.difference(C1, C2);
        System.out.println();

        Complex.product(C1, C2);
        System.out.println();

        Complex.quotient(C1, C2);
        System.out.println();
    }
}
```

Explanation

In this program, we create a class Complex. When we create an object of this class, the constructor is called, and it generates a random complex number. 2 double values are generated which form the real and imaginary parts of our complex number.

We can perform the +, -, *, / operations on our complex number using the methods in the complex class. They print the 2 complex numbers being operated on, separated by the appropriate operator, and then print the result.

Output

```
PS D:\NITJ\Sem 4\Java\Lab 5> javac Lab5.java
PS D:\NITJ\Sem 4\Java\Lab 5> java Lab5
43.36 + 43.33i
9.95 + 23.37i

(43.36 + 43.33i) + (9.95 + 23.37i) = 53.31 + 66.70i
(43.36 + 43.33i) - (9.95 + 23.37i) = 33.41 + 19.95i
(43.36 + 43.33i) * (9.95 + 23.37i) = -581.31 + 582.41i
(43.36 + 43.33i) / (9.95 + 23.37i) = -0.90 + 2.24i
PS D:\NITJ\Sem 4\Java\Lab 5>
```