

## Lab2

1)

// Define a class to represent a complex number called Complex. Provide the following methods:

// To assign initial values to the Complex object.

// To display a complex number in a+ib format.

// To add 2 complex numbers. (the return type should be Complex)

// To subtract 2 complex numbers

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

```
import java.lang.Math;
```

```
class Complex{
```

```
    int real, imaginary;
```

```
    Complex(int a, int b){
```

```
        real = a;
```

```
        imaginary = b;
```

```
    }
```

```
    void display(){
```

```
        System.out.println(real + " + i" + imaginary);
```

```
    }
```

```
    Complex add(Complex a){
```

```
        Complex sum = new Complex(0, 0);
```

```
        sum.real = real + a.real;
```

```
        sum.imaginary = imaginary + a.imaginary;
```

```
        return sum;
```

```
    }
```

```
    Complex sub(Complex a){
```

```
        Complex diff = new Complex(0, 0);
```

```
        diff.real = Math.abs(real - a.real);
```

```
        diff.imaginary = Math.abs(imaginary - a.imaginary);
```

```
        return diff;
```

```
    }
```

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

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.println("Enter real and imaginary parts: ");
```

```
        int r = sc.nextInt();
```

```
        int i = sc.nextInt();
```

```
        Complex num1 = new Complex(r, i);
```

```
        num1.display();
```

```
        System.out.println("Enter real and imaginary parts: ");
```

```
        r = sc.nextInt();
```

```

        i = sc.nextInt();
        Complex num2 = new Complex(r, i);
        num2.display();

        System.out.print("Sum = ");
        Complex sum = num1.add(num2);
        sum.display();

        System.out.print("Difference = ");
        Complex diff = num1.sub(num2);
        diff.display();
    }
}

```

```

student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ javac complex.java
student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ java Complex
Enter real and imaginary parts:
2 4
2 + i4
Enter real and imaginary parts:
3 6
3 + i6
Sum = 5 + i10
Difference = 1 + i2

```

2)

// Create a class called Time that has instance variables to represent hours, minutes and seconds.

Provide the following methods:

// To assign initial values to the Time object.

// To display a Time object in the form of hh:mm:ss {24 hours format}

// To add 2 Time objects (the return type should be a Time )

// To subtract 2 Time objects (the return type should be a Time )

// To compare 2 Time objects and to determine if they are equal or if the first is greater or smaller than the second one.

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

```
import java.lang.Math;
```

```

class Time{
    int hours, minutes, seconds;

    Time(int h, int m, int s){
        hours = h;
        minutes = m;
        seconds = s;
    }

    void display(){
        System.out.println("The time is: " + hours + ":" + minutes + ":" + seconds);
    }

    Time add(Time t){
        int carry = 0;
        Time time = new Time(0,0,0);

```

```

        time.seconds = seconds + t.seconds;
        if(time.seconds > 59){
            carry = 1; time.seconds = time.seconds%60;
        }
        time.minutes = minutes + t.minutes + carry;
        carry = 0;
        if(time.minutes > 59){
            carry = 1; time.minutes = time.minutes % 60;
        }
        time.hours = hours + t.hours + carry;
        return time;
    }

```

```

    Time sub(Time t){
        Time time = new Time(0,0,0);
        time.seconds = Math.abs(seconds - t.seconds);
        time.minutes = Math.abs(minutes - t.minutes);
        time.hours = Math.abs(hours - t.hours);
        return time;
    }

```

```

    int compare(Time t){ // 1 for t1>t2, 0 for equal, -1 t2>t1
        if(hours > t.hours)
            return 1;
        else if(t.hours > hours)
            return -1;

        if(minutes > t.minutes)
            return 1;
        else if(t.minutes > minutes)
            return -1;

        if(seconds > t.seconds)
            return 1;
        else if(t.seconds > seconds)
            return -1;

        return 0;
    }

```

```

    public static void main(String []args){
        Scanner sc = new Scanner(System.in);

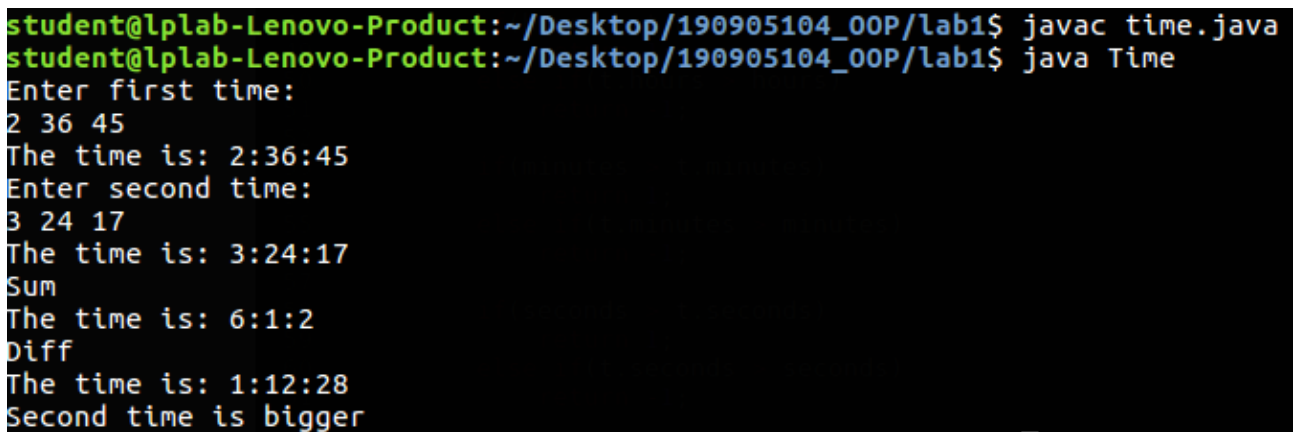
        System.out.println("Enter first time: ");
        int h = sc.nextInt();
        int m = sc.nextInt();
        int s = sc.nextInt();
        Time t1 = new Time(h, m, s);
        t1.display();
        System.out.println("Enter second time: ");
        h = sc.nextInt();
        m = sc.nextInt();

```

```

        s = sc.nextInt();
        Time t2 = new Time(h, m, s);
        t2.display();
        System.out.println("Sum");
        Time sum = t1.add(t2);
        sum.display();
        System.out.println("Diff");
        Time diff = t1.sub(t2);
        diff.display();
        int x = t1.compare(t2);
        if(x == 1)
            System.out.println("First time is bigger");
        else if(x == -1)
            System.out.println("Second time is bigger");
        else
            System.out.println("Both are equal");
    }
}

```



```

student@lplab-Lenovo-Product:~/Desktop/190905104_OOP/lab1$ javac time.java
student@lplab-Lenovo-Product:~/Desktop/190905104_OOP/lab1$ java Time
Enter first time:
2 36 45
The time is: 2:36:45
Enter second time:
3 24 17
The time is: 3:24:17
Sum
The time is: 6:1:2
Diff
The time is: 1:12:28
Second time is bigger

```

3)

// Consider the already defined Complex class. Provide a default constructor and parameterized constructor to this class. Also provide a display method. Illustrate all the constructors as well as the display method by defining Complex objects.

```

import java.util.Scanner;
import java.lang.Math;

class Complex{
    int real, imaginary;

    Complex(){
        System.out.println("default constructor");
        real = 0;
        imaginary = 0;
    }
    Complex(int a, int b){
        System.out.println("parameterised with values constructor");
        real = a;
        imaginary = b;
    }
}

```

```

Complex(Complex x){
    System.out.println("parameterised with object constructor");
    real = x.real;
    imaginary = x.imaginary;
}

void display(){
    System.out.println(real + " + i" + imaginary);
}

public static void main(String []args){
    Scanner sc = new Scanner(System.in);

    System.out.println("Default");
    Complex num = new Complex();
    num.display();

    System.out.println("Enter real and imaginary parts: ");
    int r = sc.nextInt();
    int i = sc.nextInt();
    Complex num1 = new Complex(r, i);
    num1.display();

    System.out.println("Change values of complex number");
    r = sc.nextInt();
    i = sc.nextInt();
    num1.real = r;
    num1.imaginary = i;
    System.out.println("Now let's create a new object using an old object with new
values");
    Complex num2 = new Complex(num1);
    num2.display();
}
}

```

```

student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ javac complex_pt2.java
student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ java Complex
Default
default constructor
0 + i0
Enter real and imaginary parts:
2 4
parameterised with values constructor
2 + i4
Change values of complex number
5 10
Now let's create a new object using an old object with new values
parameterised with object constructor
5 + i10

```

4)

// Create a class called Counter that contains a static data member to count the number of Counter objects being created.

// Also define a static member function called showCount() which displays the number of objects created at any given point of time. Illustrate this.

```
import java.util.Scanner;
import java.lang.Math;

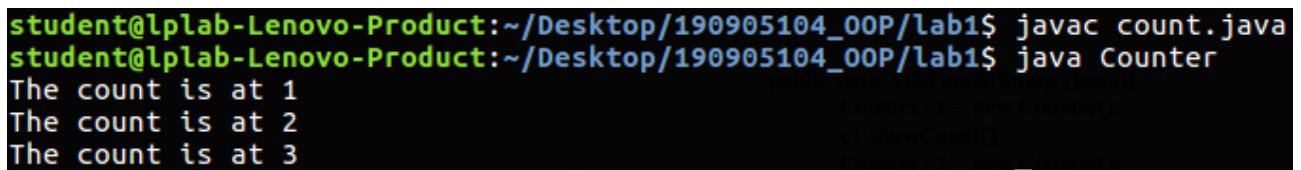
class Counter{
    static int count;

    Counter(){
        increment();
    }

    public static void increment(){
        count += 1;
    }

    public static void showCount(){
        System.out.println("The count is at " + count);
    }

    public static void main(String []args){
        Counter c1 = new Counter();
        c1.showCount();
        Counter c2 = new Counter();
        c2.showCount();
        Counter c3 = new Counter();
        c3.showCount();
    }
}
```

A terminal window with a black background and green text. The prompt is 'student@lplab-Lenovo-Product:~/Desktop/190905104\_00P/lab1\$'. The first command is 'javac count.java'. The second command is 'java Counter'. The output shows three lines: 'The count is at 1', 'The count is at 2', and 'The count is at 3'.

```
student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ javac count.java
student@lplab-Lenovo-Product:~/Desktop/190905104_00P/lab1$ java Counter
The count is at 1
The count is at 2
The count is at 3
```