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_OOP/lab1$ javac complex.java
student@lplab-Lenovo-Product:~/Desktop/190905104_OOP/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_OOP/lab1$ javac complex_pt2.jav
a
student@lplab-Lenovo-Product:~/Desktop/190905104_OOP/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();
	}
}
```

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