LAB – 2

1) Define a class to represent a complex number called Complex. Provide the following methods and write a main method to test the class.:

1. To assign initial values to the Complex object.
2. To display a complex number in a+ib format.
3. To add 2 complex numbers. (the return type should be Complex)
4. To subtract 2 complex numbers .

CODE :

```
import java.util.Scanner;


class Complex {
    int real, imag;
    Scanner sc = new Scanner(System.in);
    void read() {
        real = sc.nextInt();
        imag = sc.nextInt();
    }
    void display() {
        System.out.println(real + " +i" + imag);
    }
    Complex add(Complex b) {
        Complex c = new Complex();
        c.real = real + b.real;
        c.imag = imag + b.imag;
        return c;
    }
    Complex subtract(Complex b) {
        Complex c = new Complex();
        c.real = real - b.real;
        c.imag = imag - b.imag;
        return c;
```

```
    }
}

class complex_arithmetic {
    public static void main (String[] args) {
        System.out.print("Enter the first complex number ");
        Complex a = new Complex();
        a.read();
        System.out.print("Enter the second complex number ");
        Complex b = new Complex();
        b.read();
        System.out.print("The first complex number is ");
        a.display();
        System.out.print("The second complex number is ");
        b.display();
        System.out.print("The sum of these 2 complex numbers is ");
        Complex c = a.add(b);
        c.display();
        System.out.print("The subtraction of these 2 complex numbers is ");
        c = a.subtract(b);
        c.display();
    }
}
```

OUTPUT :

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ javac complex_arithmetic.java
student@V310Z-000:~/Desktop/200905130/Lab 2$ java complex_arithmetic
Enter the first complex number : 2 3
Enter the second complex number : 1 4
The first complex number is : (2) +i(3)
The second complex number is : (1) +i(4)
The sum of these 2 complex numbers is : (3) +i(7)
The subtraction of these 2 complex numbers is : (1) +i(-1)
```

2) Create a class called Time that has instance variables to represent hours, minutes and seconds. Provide the following methods and write a main method to test the class.:
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.

CODE :

```
import java.util.Scanner;
class Time {
    int hours, seconds, minutes;
    Scanner sc = new Scanner(System.in);
    void read() {
        hours = sc.nextInt();
        minutes = sc.nextInt();
        seconds = sc.nextInt();
    }
    void display() {
        System.out.println(hours + ":" + minutes + ":" + seconds);
    }
    Time add(Time t) {
        Time sum = new Time();
        sum.seconds = t.seconds + seconds;
        sum.minutes = t.minutes + minutes;
        sum.hours = t.hours + hours;
        if (sum.seconds >= 60) {
            sum.minutes++;
            sum.seconds -= 60;
        }
        if (sum.minutes >= 60) {
            sum.hours++;
            sum.minutes -= 60;
        }
        if (sum.hours >= 24)
```

```
        sum.hours -= 24;
    return sum;
}
Time subtract(Time t) {
    Time sub = new Time();
    int res = this.compare(t);
    if (res == 0) {
        sub.seconds = 0;
        sub.minutes = 0;
        sub.hours = 0;
        return sub;
    }
    Time max = new Time();
    Time min = new Time();
    if (res == 1) {
        max = t;
        min = this;
    } else {
        max = this;
        min = t;
    }
    sub.seconds = max.seconds - min.seconds;
    sub.minutes = max.minutes - min.minutes;
    sub.hours = max.hours - min.hours;
    if (sub.seconds < 0) {
        sub.minutes--;
        sub.seconds += 60;
    }
    if (sub.minutes < 0) {
        sub.hours--;
        sub.minutes += 60;
    }
    return sub;
}
```

```
    int compare(Time t) {
        if (t.hours == hours && t.seconds == seconds && t.minutes == minutes) {
            return 0;
        }
        if (t.hours > hours) {
            return 1;
        } else if (t.hours < hours) {
            return 2;
        } else if (t.minutes > minutes) {
            return 1;
        } else if (t.minutes < minutes) {
            return 2;
        } else if (t.seconds > seconds) {
            return 1;
        } else {
            return 2;
        }
    }
}
public class time {
    public static void main(String[] args) {
        Time s = new Time();
        Time t = new Time();
        System.out.print("Enter the first time (in 24 hours format) : ");
        s.read();
        System.out.print("Enter the second time (in 24 hours format) : ");
        t.read();
        int res = s.compare(t);
        if (res == 0)
            System.out.println("The 2 times are equal ");
        else if (res == 1)
            System.out.println("The second time is greater than the first time");
        else System.out.println("The first time is greater than the second time");
        System.out.println("The sum of the 2 times is " + s.add(t).hours + ":" +
s.add(t).minutes + ":" + s.add(t).seconds);
```

```
        System.out.println("The difference of the 2 times is " + s.subtract(t).hours + ":" + s.subtract(t).minutes + ":" + s.subtract(t).seconds);
    }
}
```

OUTPUT :

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ javac time.java
student@V310Z-000:~/Desktop/200905130/Lab 2$ java time
Enter the first time (in 24 hours format) : 13 52 17
Enter the second time (in 24 hours format) : 7 22 59
The first time is greater than the second time
The sum of the 2 times is 21:15:16
The difference of the 2 times is 6:29:18
```

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ java time
Enter the first time (in 24 hours format) : 16 26 36
Enter the second time (in 24 hours format) : 22 22 22
The second time is greater than the first time
The sum of the 2 times is 14:48:58
The difference of the 2 times is 5:55:46
```

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ java time
Enter the first time (in 24 hours format) : 9 30 0
Enter the second time (in 24 hours format) : 9 30 0
The 2 times are equal
The sum of the 2 times is 19:0:0
The difference of the 2 times is 0:0:0
```

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.

CODE :

```
import java.util.Scanner;

class Complex {
    int real, imag;
    Scanner sc = new Scanner(System.in);
    Complex() {
        real = 0;
        imag = 0;
    }
```

```
    Complex(int x, int y) {
        real = x;
        imag = y;
    }
    void read() {
        real = sc.nextInt();
        imag = sc.nextInt();
    }
    void display() {
        System.out.println("(" + real + ") +i(" + imag + ")");
    }
    Complex add(Complex b) {
        Complex c = new Complex();
        c.real = real + b.real;
        c.imag = imag + b.imag;
        return c;
    }
    Complex subtract(Complex b) {
        Complex c = new Complex();
        c.real = real - b.real;
        c.imag = imag - b.imag;
        return c;
    }
}

public class construct_complex {
    public static void main (String[] args) {
        Complex p = new Complex(); // default constructor invoked
        Complex q = new Complex(2, 3); // parameterized constructor invoked
        System.out.print("Complex number created by default constructor is : ");
        p.display();
        System.out.print("Complex number created by parameterized constructor is : ");
        q.display();
        System.out.print("Enter the first complex number : ");
        Complex a = new Complex();
        a.read();
        System.out.print("Enter the second complex number : ");
        Complex b = new Complex();
        b.read();
        System.out.print("The first complex number is : ");
        a.display();
        System.out.print("The second complex number is : ");
        b.display();
        System.out.print("The sum of these 2 complex numbers is : ");
        Complex c = a.add(b);
        c.display();
        System.out.print("The subtraction of these 2 complex numbers is : ");
        c = a.subtract(b);
        c.display();
    }
}
```

OUTPUT :

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ javac construct_complex.java
student@V310Z-000:~/Desktop/200905130/Lab 2$ java construct_complex
Complex number created by default constructor is : (0) +i(0)
Complex number created by parameterized constructor is : (2) +i(3)
Enter the first complex number : 3 2
Enter the second complex number : 4 5
The first complex number is : (3) +i(2)
The second complex number is : (4) +i(5)
The sum of these 2 complex numbers is : (7) +i(7)
The subtraction of these 2 complex numbers is : (-1) +i(-3)
```

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.

CODE :

```
class Counter {
	static int n = 0;
	Counter() {
		System.out.println("New object got created");
		this.n++;
	}
	static void showCount() {
		System.out.println("Number of Objects : " + n);
	}
}
class testcount {
	public static void main(String args[]) {
		Counter a = new Counter();
		Counter b = new Counter();
		Counter.showCount();
		Counter c = new Counter();
		Counter.showCount();
	}
}
```

OUTPUT :

```
student@V310Z-000:~/Desktop/200905130/Lab 2$ javac testcount.java
student@V310Z-000:~/Desktop/200905130/Lab 2$ java testcount
New object got created
New object got created
Number of Objects : 2
New object got created
Number of Objects : 3
```

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