

OOP Lab

Week 2 Assignment Submission

Lab 2 : Classes and Objects, Constructors and Static Members

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

- 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 Write a main method to test the class.

Code:

```
import java.util.*;

public class Complex

{

    int a,ib;

    Complex() //Default Constructor

    {

        this.a=0;

        this.ib=0;

    }

    Complex(int c,int d) //Parameterized Constructor
```

```

{
    this.a=c;

    this.ib=d;
}

public void Display()
{
    if(ib==0)

        System.out.println("The complex number is "+a);

    else if(ib!=0 && a==0)

        System.out.println("The complex number is "+ib+"i");

    else

        System.out.println("The complex number is "+a+" "+ib+"i");
}

public Complex Add(Complex Cmp1,Complex Cmp2)
{
    int x=Cmp1.a+Cmp2.a;

    int y=Cmp1.ib+Cmp2.ib;

    Complex ResAdd=new Complex(x,y);    //Generating new complex
number after addition

    return ResAdd;
}

```

```

public Complex Subtract(Complex Cmp1,Complex Cmp2)
{
    int x=Cmp1.a-Cmp2.a;

    int y=Cmp1.ib-Cmp2.ib;

    Complex ResSub=new Complex(x,y); //Generating new complex
number after subtraction

    return ResSub;
}

public static void main(String[] args)
{
    System.out.println("Registration number 200905044 Name:
Praveen Varma Question 1");

    Complex cmp=new Complex(); // Generating new Complex number
using default constructor

    System.out.println("Default Complex number");

    cmp.Display(); //Displaying Default value of Complex number

    Scanner sc=new Scanner(System.in);

    System.out.println("Enter the real part of complex number");

    int Real=sc.nextInt();

    System.out.println("Enter the imaginary part of complex number");

    int Imag=sc.nextInt();

```

```
    cmp=new Complex(Real,Imag); // Generating new Complex number  
using parameterised constructor
```

```
    cmp.Display(); //Displaying the complex number entered by the user
```

```
    System.out.println("Enter the 2 complex numbers to add and  
subtract");
```

```
    System.out.println("Enter the real part of 1st complex number");
```

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

```
    System.out.println("Enter the imaginary part of 1st complex  
number");
```

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

```
    Complex Cmp1=new Complex(a,b); // Generating first Complex  
number using parameterised constructor
```

```
    System.out.println("Enter the real part of 2nd complex number");
```

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

```
    System.out.println("Enter the imaginary part of 2nd complex  
number");
```

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

```
    Complex Cmp2=new Complex(x,y); // Generating second Complex  
number using parameterised constructor
```

```
    System.out.println("First Complex number");
```

```
Cmp1.Display();
```

```
System.out.println("Second Complex number");
```

```
Cmp2.Display();
```

```
Complex ResAdd=new Complex(); // Generating Resultant Complex  
number using parameterised constructor
```

```
ResAdd=ResAdd.Add(Cmp1,Cmp2);
```

```
System.out.println("Result after addition");
```

```
ResAdd.Display(); // displaying result of addition
```

```
Complex ResSub=new Complex(); // Generating Resultant Complex  
number using parameterised constructor
```

```
ResSub=ResSub.Subtract(Cmp1,Cmp2);
```

```
System.out.println("Result after Subtraction of Second Complex  
number FROM the first");
```

```
ResSub.Display(); // displaying result of subtraction
```

```
}
```

```
}
```

Output:

```
student@dslab: ~/200905044/oop-lab/week-2
File Edit View Search Terminal Help

student@dslab:~/200905044/oop-lab/week-2$ javac Complex.java
student@dslab:~/200905044/oop-lab/week-2$ java Complex
Registration number 200905044 Name: Praveen Varma Question 1
Default Complex number
The complex number is 0
Enter the real part of complex number
5
Enter the imaginary part of complex number
3
The complex number is 5+3i
Enter the 2 complex numbers to add and subtract
Enter the real part of 1st complex number
9
Enter the imaginary part of 1st complex number
4
Enter the real part of 2nd complex number
6
Enter the imaginary part of 2nd complex number
4
First Complex number
The complex number is 9+4i
Second Complex number
The complex number is 6+4i
Result after addition
The complex number is 15+8i
Result after Subtraction of Second Complex number FROM the first
The complex number is 3
student@dslab:~/200905044/oop-lab/week-2$
```

2.

Create a class called Time that has instance variables to represent hours, minutes and seconds. Provide the following methods:

- 1.To assign initial values to the Time object.
- 2.To display a Time object in the form of hh:mm:ss {24 hours format}
- 3.To add 2 Time objects (the return type should be a Time)
- 4.To subtract 2 Time objects (the return type should be a Time)
- 5.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.*;
```

```
import java.lang.*;
```

```
public class Time {
```

```
    int Hours, Mins, Secs;
```

```
    // default constructor
```

```
    Time() {
```

```
        Hours = 0;
```

```
        Mins = 0;
```

```
        Secs = 0;
```

```
    }
```

```
    // parameterised constructor
```

```
    Time(int h, int m, int s) {
```

```
        this.Hours = h;
```

```
        this.Mins = m;
```

```
        this.Secs = s;
```

```
    }
```

```
    // display the Time object in hh:mm:ss format
```

```
    void Display() {
```

```
        System.out.println(+this.Hours + ":" + this.Mins + ":" + this.Secs);  
    }  
  
}
```

```
// add two Time objects
```

```
Time Add(Time t1, Time t2) {
```

```
    Time t3 = new Time();
```

```
    t3.Hours = t1.Hours + t2.Hours;
```

```
    t3.Mins = t1.Mins + t2.Mins;
```

```
    t3.Secs = t1.Secs + t2.Secs;
```

```
    if (t3.Secs >= 60) {
```

```
        t3.Secs %= 60;
```

```
        t3.Mins += 1;
```

```
    }
```

```
    if (t3.Mins >= 60) {
```

```
        t3.Mins %= 60;
```

```
        t3.Hours += 1;
```

```
    }
```

```
    if (t3.Hours > 23) {
```

```
        t3.Hours %= 24;
```

```
    }
```

```
    return t3;
```



```
}
```

```
// subtract two Time objects
```

```
Time Subtract(Time T1, Time T2) {
```

```
    Time T3 = new Time();
```

```
    int t1, t2, diff;
```

```
    t1 = T1.Secs + T1.Mins * 60 + T1.Hours * 60 * 60;
```

```
    t2 = T2.Secs + T2.Mins * 60 + T2.Hours * 60 * 60;
```

```
    diff = Math.abs(t1 - t2);
```

```
    T3.Hours = diff / 3600;
```

```
    diff = diff % 3600;
```

```
    T3.Mins = diff / 60;
```

```
    T3.Secs = diff % 60;
```

```
    return T3;
```

```
}
```

```
void Compare(Time t1, Time t2) {
```

```
    if (t1.Hours == t2.Hours && t1.Mins == t2.Mins && t1.Secs ==  
t2.Secs)
```

```
        System.out.println("Time = Time2");
```

```
        else if (t1.Hours > t2.Hours || (t1.Hours == t2.Hours && t1.Mins >
t2.Mins)
```

```
            || (t1.Hours == t2.Hours && t1.Mins == t2.Mins && t1.Secs >
t2.Secs))
```

```
        System.out.println("Time1 > Time2");
```

```
    else
```

```
        System.out.println("Time1 < Time2");
```

```
    }
```

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

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

```
    System.out.println("Enter the time as follows for 1st Time object:");
```

```
    System.out.print("Enter hours: ");
```

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

```
    System.out.print("Enter minutes: ");
```

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

```
    System.out.print("Enter seconds: ");
```

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

```
    Time ob1 = new Time(h,m,s);
```

```
    System.out.println("Enter the time as follows for 2nd Time object:");
```

```
    System.out.print("Enter hours: ");
```

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

```
    System.out.print("Enter minutes: ");
```

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

```
System.out.print("Enter seconds :");  
s = sc.nextInt();
```

```
Time ob2 = new Time(h,m,s);
```

```
System.out.println("1st Time is: ");  
ob1.Display();
```

```
System.out.println("2nd Time is: ");  
ob2.Display();
```

```
Time ob3 = new Time();
```

```
ob3=ob3.Add(ob1,ob2);
```

```
System.out.println("The resultant of addition of time is:  
"+ob3.Hours+":"+ob3.Mins+":"+ob3.Secs);
```

```
ob3=ob3.Subtract(ob1,ob2);
```

```
System.out.println("The resultant of subtract of time is:  
"+ob3.Hours+":"+ob3.Mins+":"+ob3.Secs);
```

```
System.out.println("On comparing the two Time objects, we get: ");  
ob3.Compare(ob1,ob2);
```

```
}
```

```
}
```

Output:

```
student@dslab: ~/200905044/oop-lab/week-2
File Edit View Search Terminal Help
student@dslab:~/200905044/oop-lab/week-2$ javac Time.java
student@dslab:~/200905044/oop-lab/week-2$ java Time
Enter the time as follows for 1st Time object:
Enter hours: 14
Enter minutes: 40
Enter seconds: 20
Enter the time as follows for 2nd Time object:
Enter hours: 6
Enter minutes: 15
Enter seconds :10
1st Time is:
14:40:20
2nd Time is:
6:15:10
The resultant of addition of time is: 20:55:30
The resultant of subtract of time is: 8:25:10
On comparing the two Time objects, we get:
Time1 > Time2
student@dslab:~/200905044/oop-lab/week-2$
```

```
student@dslab: ~/200905044/oop-lab/week-2
File Edit View Search Terminal Help
student@dslab:~/200905044/oop-lab/week-2$ javac Time.java
student@dslab:~/200905044/oop-lab/week-2$ java Time
Enter the time as follows for 1st Time object:
Enter hours: 23
Enter minutes: 59
Enter seconds: 0
Enter the time as follows for 2nd Time object:
Enter hours: 20
Enter minutes: 49
Enter seconds :45
1st Time is:
23:59:0
2nd Time is:
20:49:45
The resultant of addition of time is: 20:48:45
The resultant of subtract of time is: 3:9:15
On comparing the two Time objects, we get:
Time1 > Time2
student@dslab:~/200905044/oop-lab/week-2$
```

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.*;
```

```
public class Complex
{
    int a,ib;

    Complex() //Default Constructor
    {
        this.a=0;

        this.ib=0;
    }

    Complex(int c,int d) //Parameterized Constructor
    {
        this.a=c;

        this.ib=d;
    }
// displaying the complex number
    public void Display()
    {
        if(ib==0)

            System.out.println("The complex number is "+a);

        else if(ib!=0 && a==0)

            System.out.println("The complex number is "+ib+"i");
    }
}
```

else

System.out.println("The complex number is "+a+" "+ib+"i");

}

public Complex Add(Complex Cmp1,Complex Cmp2)

{

int x=Cmp1.a+Cmp2.a;

int y=Cmp1.ib+Cmp2.ib;

Complex ResAdd=new Complex(x,y); //Generating new
complex number after addition

return ResAdd;

}

public Complex Subtract(Complex Cmp1,Complex Cmp2)

{

int x=Cmp1.a-Cmp2.a;

int y=Cmp1.ib-Cmp2.ib;

Complex ResSub=new Complex(x,y); //Generating new
complex number after subtraction

return ResSub;

}

public static void main(String[] args)

{

**System.out.println("Registration number 200905044
Name: Praveen Varma Question 3");**

Complex cmp=new Complex(); // **Generating new Complex number using default constructor**

System.out.println("Default Complex number");

cmp.Display(); //**Displaying Default value of Complex number**

Scanner sc=new Scanner(System.in);

System.out.println("Enter the real part of complex number");

int Real=sc.nextInt();

System.out.println("Enter the imaginary part of complex number");

int Imag=sc.nextInt();

cmp=new Complex(Real,Imag); // **Generating new Complex number using parameterised constructor**

cmp.Display(); //**Displaying the complex number entered by the user**

System.out.println("Enter the 2 complex numbers to add and subtract");

System.out.println("Enter the real part of 1st complex number");

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

```
System.out.println("Enter the imaginary part of 1st complex number");
```

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

```
Complex Cmp1=new Complex(a,b); // Generating first Complex number using parameterised constructor
```

```
System.out.println("Enter the real part of 2nd complex number");
```

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

```
System.out.println("Enter the imaginary part of 2nd complex number");
```

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

```
Complex Cmp2=new Complex(x,y); // Generating second Complex number using parameterised constructor
```

```
System.out.println("First Complex number");
```

```
Cmp1.Display();
```

```
System.out.println("Second Complex number");
```

```
Cmp2.Display();
```

```
Complex ResAdd=new Complex(); // Generating Resultant Complex number using parameterised constructor
```



```
ResAdd=ResAdd.Add(Cmp1,Cmp2);
```

```
System.out.println("Result after addition");
```

```
ResAdd.Display(); // displaying result of addition
```

```
Complex ResSub=new Complex(); // Generating Resultant  
Complex number using parameterised constructor
```

```
ResSub=ResSub.Subtract(Cmp1,Cmp2);
```

```
System.out.println("Result after Subtraction of Second  
Complex number FROM the first");
```

```
ResSub.Display(); // displaying result of subtraction
```

```
}
```

```
}
```

Output:

```
student@dslab: ~/200905044/oop-lab/week-2
File Edit View Search Terminal Help

student@dslab:~/200905044/oop-lab/week-2$ javac Complex.java
student@dslab:~/200905044/oop-lab/week-2$ java Complex
Registration number 200905044 Name: Praveen Varma Question 1
Default Complex number
The complex number is 0
Enter the real part of complex number
5
Enter the imaginary part of complex number
3
The complex number is 5+3i
Enter the 2 complex numbers to add and subtract
Enter the real part of 1st complex number
9
Enter the imaginary part of 1st complex number
4
Enter the real part of 2nd complex number
6
Enter the imaginary part of 2nd complex number
4
First Complex number
The complex number is 9+4i
Second Complex number
The complex number is 6+4i
Result after addition
The complex number is 15+8i
Result after Subtraction of Second Complex number FROM the first
The complex number is 3
student@dslab:~/200905044/oop-lab/week-2$
```

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:

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

```
class Counter
```

```
{
```

```
static int count=0;
```

```
Counter()
```

```
{
```

```
    count++;
```

```
}
```

```
static void showCount()
```

```
{
```

```
    System.out.println("Count = "+count);
```

```
}
```

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

```
{
```

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

```
    System.out.println("Enter Number of Objects to be created : ");
```

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

```
    Counter obj[] = new Counter[n];
```

```
    for(int i = 0 ; i < n ; i++){
```

```
        obj[i] = new Counter();
```


```
        obj[i].showCount();
```

```
    }
```

```
}
```

}

Output:

A terminal window with a dark background and light text. The title bar at the top reads 'student@dslab: ~/200905044/oop-lab/week-2'. Below the title bar is a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The terminal content shows the following sequence of commands and output:

```
student@dslab:~/200905044/oop-lab/week-2$ javac Counter.java
student@dslab:~/200905044/oop-lab/week-2$ java Counter
Enter Number of Objects to be created :
5
Count = 1
Count = 2
Count = 3
Count = 4
Count = 5
student@dslab:~/200905044/oop-lab/week-2$
```

THANK YOU!