

Programming Paradigms Laboratory

B.Tech.



Name : KAUSHAL VASHISTH

Roll Number : 18ETCS002147

Department : Computer Science and Engineering

Faculty of Engineering & Technology
Ramaiah University of Applied Sciences

Faculty	Engineering & Technology
Programme	B. Tech. in Computer Science and Engineering
Year/Semester	2 nd Year / 4 th Semester
Name of the Laboratory	Programming Paradigms Laboratory
Laboratory Code	19CSL217A

Laboratory 2

Title of the Laboratory Exercise: Classes and Objects

1. Questions

- a. Develop a java program to Create a class called Employee that includes three instance variables—a first name (type String), a last name (type String) and a monthly salary (double). Define a constructor that initializes the three instance variables, setInfo() and a getInfo() which takes the salary, number of hours of work per day of employee as parameter method. If the monthly salary is not positive, do not set its value. Create two Employee objects and display each object's yearly salary. Then give each Employee a 10% raise and display each Employee's yearly salary again.
- b. Create a class MyComplex that includes real and imaginary instance variables. Define a constructor to initializes instance variables using this keyword and methods to perform arithmetic operations.

2. Calculations/Computations/Algorithms:-

```
package lab2;
class employee{
    //instance variables
    String first,last;
    double msalary;
    int hours;

    employee(String f1,String l1){
        this.first=f1;
        this.last=l1;
    }

    void setinfo(double s,int hours){
        if(s>0){
            this.msalary=s;
        }
        this.hours=hours;
    }
    void getinfo(){
        double annual_sal=this.msalary*12;
        System.out.println("annual salary of "+ first+" is "+annual_sal);
        double raise_sal=annual_sal*(1.1);
        System.out.println("annual raised salary of "+ first+" is "+raise_sal);
    }
}
public class Lab2 {
    public static void main(String[] args) {
        employee e1= new employee("tushar","pandey");
        e1.setinfo(80000,9);
        e1.getinfo();
        employee e2= new employee("kaushal","vashisth");
        e2.setinfo(90000,8);
        e2.getinfo();
    }
}
```

Figure 1:- Q1 source code

```
package lab22;
import java.util.Scanner;
public class Lab22 {

    int r1,i1;
    int r2,i2;
    Lab22(int r1,int i1,int r2,int i2){
        this.r1=r1;this.r2=r2;
        this.i1=i1;this.i2=i2;
    }
    void numdisplay(){
        System.out.println("arithmetic operations of (" +this.r1+")"+"(" +this.i1+
        ")i and (" +this.r2+")"+"(" +this.i2+")i are:-" );
    }
    void add(){
        int real=this.r1+this.r2;
        int img=this.i1+this.i2;
        System.out.println("addition is "+real+"+" +img+"i");
    }
    void sub(){
        int real=this.r1-this.r2;
        int img=this.i1-this.i2;
        System.out.println("subtraction is (" +real+")"+"(" +img+")i");
    }
    void mul(){
        //multiplication identity (a+b*i)(c+d*i)=(ac-bd)+(ad+bc)i;
        int real=this.r1*this.r2-this.i1*this.i2;
        int img=this.r1*this.i2+this.i1*this.r2;
        System.out.println("multiplication is (" +real+")"+"(" +img+")i");
    }
    void div(){
        //approach is to multiply and divide by conjugate of denominator
        // (a+b*i)/(c+d*i)=((a+b*i)(c-d*i))/(c^2+d^2)
        float deno;//denominator
        deno=(this.r2)*(this.r2)+(this.i2)*(this.i2);
        float real=(this.r1*this.r2+this.i1*this.i2)/deno;
        float img=(this.i1*this.r2-this.r1*this.i2)/deno;
        System.out.println("division is (" +real+")"+"(" +img+")i");
    }
}
```

Figure 2:- Q2 source code snippet 1.

```
public static void main(String[] args) {  
    Scanner sc =new Scanner(System.in);  
    System.out.println("enter real part of number 1:-");  
    int r1=sc.nextInt();  
    System.out.println("enter imaginary part of number 1:-");  
    int i1=sc.nextInt();  
    System.out.println("enter real part of number 2:-");  
    int r2=sc.nextInt();  
    System.out.println("enter imaginary part of number 2:-");  
    int i2=sc.nextInt();  
    sc.close();  
    Lab22 o1=new Lab22(r1,i1,r2,i2);//r1 i1 r2 i2  
    o1.numdisplay();  
    o1.add();  
    o1.sub();  
    o1.mul();  
    o1.div();  
}  
}
```

Figure 3:- Q2 source code snippet 2

3. Presentation of Results

Results for Q1:-

```
run:
annual salary of tushar is 960000.0
annual raised salary of tushar is 1056000.0
annual salary of kaushal is 1080000.0
annual raised salary of kaushal is 1188000.0
BUILD SUCCESSFUL (total time: 0 seconds)
```

Results for Q2:-

```
run:
enter real part of number 1:-
1
enter imaginary part of number 1:-
-2
enter real part of number 2:-
3
enter imaginary part of number 2:-
4
arithmetic operations of (1)+(-2)i and(3)+(4)i are:-
addition is 4+2i
subtraction is (-2)+(-6)i
multiplication is (11)+(-2)i
division is (-0.2)+(-0.4)i
BUILD SUCCESSFUL (total time: 5 seconds)
```

4. Conclusions :-

All the programs have been executed successfully.

Multiplication and division of complex numbers can be done by:-

$$\begin{aligned}(a + bi)(c + di) &= ac + adi + bci + bdi^2 \\ &= ac + (ad + bc)i - bd \quad (\text{Remember } i^2 = -1) \\ &= (ac - bd) + (ad + bc)i\end{aligned}$$

$$\frac{a + bi}{(c + di)} \cdot \frac{c - di}{c - di} = \frac{((ac + bd) + (bc - ad)i)}{c^2 + d^2}$$

5. Limitations of Experiments and Results:-

- In q1, if we give negative monthly salary then the program will give annual salary and annual raised salary as zero. Because we are not setting the value of monthly salary if it is negative.

Ex:-

```
run:
annual salary of tushar is 0.0
annual raised salary of tushar is 0.0
annual salary of kaushal is 1080000.0
annual raised salary of kaushal is 1188000.0
BUILD SUCCESSFUL (total time: 0 seconds)
```

- In q2, the program will give input “Input Mismatch Exception” if give decimal values.

Ex:-

```
run:
enter real part of number 1:-
1.1
Exception in thread "main" java.util.InputMismatchException
    at java.util.Scanner.throwFor(Scanner.java:864)
    at java.util.Scanner.next(Scanner.java:1485)
    at java.util.Scanner.nextInt(Scanner.java:2117)
    at java.util.Scanner.nextInt(Scanner.java:2076)
    at lab22.Lab22.main(Lab22.java:43)
C:\Users\lenovo\AppData\Local\NetBeans\Cache\8.2\executor-snippets\
run.xml:53: Java returned: 1
BUILD FAILED (total time: 6 seconds)
```