Programming Paradigms Laboratory

B.Tech.

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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

```
Step 1: Create Employee class

Step 2: Define instance variables String fName, lName, double salary,
workhours

Step 3: Define a constructor which takes the first, last name and the
salary of the employee as parameters

Step 4: public void setinfo(double salary, double workHours) {
              if (salary >= 0)
                    this.salary = salary;
                    this.workHours = workHours;
        }

Step 5: define getinfo method to print employee details

Step 6: public void giveRaise(double rate) {
              this.salary = rate * 0.01 * this.salary + this.salary;
        }
```

Step 7: public void getAnnualSalary() {

```
        double annualSal = this.salary * 12;
        System.out.println("Annual Salary is" + annualSal);
    }
```

Step 8: Define another class EmplyoeeMain, within the same package

Step 9: create new employee objects with the help of the constructor

Step 10: Perform the required operations, like set and get info or giving raise, etc.

b.

Step 1: Create Complex class

Step 2: define instance variable real, imagi of type double

Step 3: Create constructor which takes the real and imaginary part of the complex number as parameters

Step 4: define static methods to compute the sum, difference and product of two complex numbers.

Step 5: define a method to display the complex number

Step 6: Create a Class ComplexMain

Step 7: Create the objects of Complex class

Step 8: Perform the required arithmetic operation on the objects

Step 9: display the result.

3. Presentation of Results

```java
public class Employee {

    // instance variables
    String fName, lName;
    double mSalary;
    int workHours;

    // constructor ---- to initialing variables
    Employee(String fName, String lName, double mSalary) {
        this.fName = fName;
        this.lName = lName;
        this.mSalary = mSalary;
    }

    // setInfo -- to update
    public void setInfo(double mSalary, int workHours) {
        if (mSalary >= 0) {
            this.mSalary = mSalary;
        }
        this.workHours = workHours;
    }

    public void getInfo() {
        System.out.println("Salary of " + this.fName + " " + this.lName + " is " + this.mSalary);
    }

    public void giveRaise(Double percent) {
        this.mSalary = percent * 0.01 * this.mSalary + this.mSalary;
    }

    public void getAnnualSal() {
        double annualSal = mSalary * 12;
        System.out.println("the annual Salary is " + annualSal);
    }

}
```

Figure 1 Employee Class

```java
public class EmpMain {

    Run | Debug
    public static void main(String[] args) {
        Employee e1 = new Employee("subhendu", "maji", 7852.0);
        e1.getInfo();
        e1.setInfo(8000.0, 5);
        e1.getInfo();

        e1.giveRaise(50.0);
        e1.getInfo();
        e1.getAnnualSal();

        Employee e2 = new Employee("abc", "xyz", 4521.0);
        e2.getInfo();
        e2.setInfo(5000.0, 5);
        e2.getInfo();

        e2.giveRaise(10.0);
        e2.getInfo();
        e2.getAnnualSal();

    }
}
```

Figure 2 EmployeeMain Class

```
PS D:\RUAS-sem-04\PP\Java\lab02> cd "d:\RUAS-sem-04\PP\Java\lab02\"
EmpMain }
Salary of subhendu maji is 7852.0
Salary of subhendu maji is 8000.0
Salary of subhendu maji is 12000.0
the annual Salary is 144000.0
Salary of abc xyz is 4521.0
Salary of abc xyz is 5000.0
Salary of abc xyz is 5500.0
the annual Salary is 66000.0
PS D:\RUAS-sem-04\PP\Java\lab02>
```

Figure 3 output of employee class

```java
public class Complex {

    double real, imagi;

    Complex(double real, double imagi) {
        this.real = real;
        this.imagi = imagi;
    }

    public static Complex sum(Complex obj1, Complex obj2) {
        double real1 = obj1.real + obj2.real;
        double imagi1 = obj1.imagi + obj2.imagi;
        Complex result = new Complex(real1, imagi1);
        return result;
    }

    public static Complex diff(Complex obj1, Complex obj2) {
        double real1 = obj1.real - obj2.real;
        double imagi1 = obj1.imagi - obj2.imagi;
        Complex result = new Complex(real1, imagi1);
        return result;
    }

    public static Complex mul(Complex obj1, Complex obj2) {
        double real1 = obj1.real * obj2.real - obj1.imagi * obj2.imagi;
        double imagi1 = obj1.real * obj2.imagi + obj2.real * obj1.imagi;
        Complex result = new Complex(real1, imagi1);
        return result;
    }

    public void disp() {
        System.out.println(this.real + " + " + this.imagi + "i");
    }

}
```

Figure 4 complex class

```java
public class ComplexMain {

    Run | Debug
    public static void main(String args[]) {
        Complex c1 = new Complex(5.5, 4);
        Complex c2 = new Complex(1.2, 3.5);
        Complex sum = Complex.sum(c1, c2);
        Complex diff = Complex.diff(c1, c2);
        Complex prod = Complex.mul(c1, c2);
        sum.disp();
        diff.disp();
        prod.disp();
    }
}
```

Figure 5 complex Main class

```
PS D:\RUAS-sem-04\PP\Java\lab02> cd "d:\RUAS-sem-04\PP\Java\lab02\" ;
ava ComplexMain }
6.7 + 7.5i
4.3 + 0.5i
-7.4 + 24.05i
```

Figure 6 output of complex

4. Conclusions

- When we define a class, a java creates a default constructor. We can also create a parameterized constructor manually
- Instance variable vary with different objects of the same class, class variable are the same throughout the class
- Static methods are the methods of the class, whereas the others are the methods of the object of the class.
- At most one public class definition per file. This class name should match the file name. If there are more than one public class definitions, compiler will accept the class with the file's name and give an error at the line where the other class is defined.
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5. Limitations of Experiments and Results

- In Complex arithmetic program, program does not calculate division of two complex numbers, it can be implemented.