- Experiment 4 -

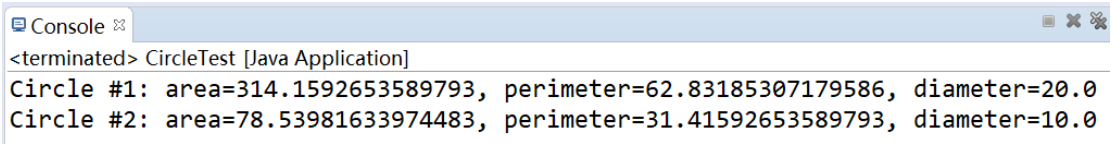
Create a Java project named Experiment4 and create the following classes in the project.

1. Define a public class named Circle that contains:
   a private instance field: radius
   a no-argument constructor
   a constructor with parameters
   a mutator method: set the value of radius // setRadius()
   a accessor method: get the value of radius // getRadius()
   an area method: get the area of circle // area()
   a perimeter method: get the perimeter of circle // perimeter()

Next, define another public class named CircleTest that can perform the following tasks:

- Use the no-argument constructor to create a Circle object, and call the mutator method to set the value of radius (say 10), and then output its area, perimeter and diameter;
- Create another Circle object by using the constructor with parameters (say 5), and then output its area, perimeter and diameter.

[Sample]

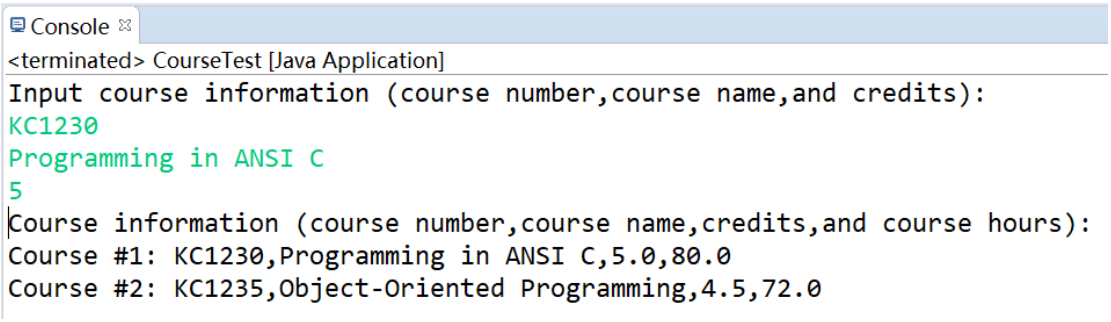


2. Define a public class named Course that contains:
   private instance fields: course number, course title, credits
   a no-argument constructor
   a constructor with parameters
   mutator and accessor methods for each field
   a method for calculating course hours (credits*16)

Next, define another public class named CourseTest that can perform the following tasks:

- Input course information from the keyboard, such as: course number (KC1234); course name (Programming in C); credits (5);
- create two objects by using no-argument constructor and constructor with parameters respectively;
- Output all the information of courses: course number, course name, course credits, and course hours.

[Sample]



3. Define a public class named Student that includes the following:

- private instance fields: student number(stuNum), name(stuName), age(stuAge), total number of students in the class(totalNum), where totalNum should be set as a static field (why?)
- Constructors: no-argument and with parameters (consider the change of totalNum when creating objects)
- Methods: accessor methods; mutator methods; static methods (get total number of students in the class, set total number of students in the class); and a method named printStudent that can output the information of student as following format:
  number, name, age, and total number of students

Next, add a main method to the class Student, and implement the following tasks:

- Create a student object st1, initialize the student number(s001), name(孙悟空), age(525);
- Output information of student st1 (number, name, age, and total number of students);
- Create another object st2, initialize the student number(s002), name(唐僧), age(50);
- Output information of student st2 (number, name, age, and total number of students);
- Set the total number of students to 35;
- Use System.out.println to output the information of student st1 and st2 (number, name, and total number of students) again. When outputting the total number of students, use ***ClassName.method*** for **st1**and ***object.method*** for **st2**, respectively;
- Use no-argument constructor to create an object st3, and set its fields by calling mutator methods, student number(s003), name(tom), age(19);
- Output information of student st3 (number, name, age, and total number of students);

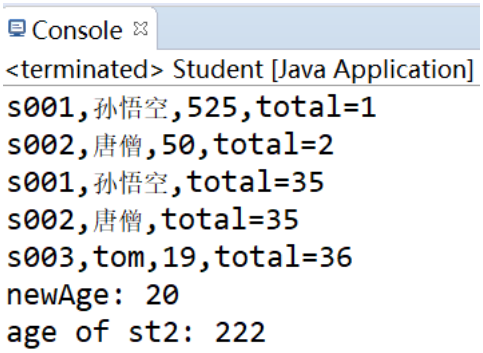
Finally, add the following methods to class Student:

```
public void changeValue(int age) { age = 111; }
public void changeValue(Student s) { s.stuAge=222; }
```

and in the main method, test the following operations:

- Declare an int newAge=20 variable, call the changeValue method by using object st1 (newAge as parameter), and then output newAge to see if its value is the original 20 or not
- Use object st1 to call the changeValue method (st2 as parameter), and then output stuAge of st2 to see if its value is the original 50 or not

[Sample]

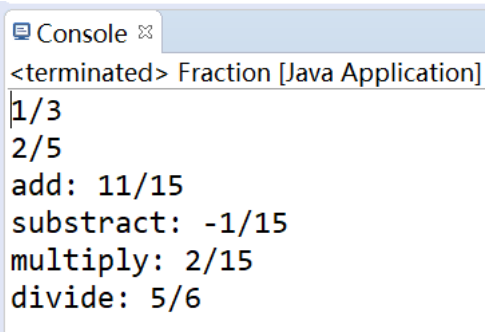


4. Numbers of the form a/b are called fractions, where both a and b are integers. Please complete the following codes so that it can add, subtract, multiply and divide fractions and output the results.

```
public class Fraction {
    private int fz, fm;
    // insert your codes here
    Fraction(int fz, int fm) { this.fz=fz; this.fm=fm; }
    public void setFz(int fz) { this.fz=fz; }
    public void setFm(int fm) { this.fm=fm; }
    public Fraction add(Fraction f1) {
        Fraction fs=new Fraction();
        fs.setFz(this.fz*f1.fm+this.fm*f1.fz);
        fs.setFm(this.fm*f1.fm);
        return fs;
    }
    // insert your codes here
    public static Fraction multiply(Fraction f1, Fraction f2) {
        Fraction fs=new Fraction();
        fs.setFz(f1.fz*f2.fz);
        fs.setFm(f1.fm*f2.fm);
        return fs;
    }
    // insert your codes here
    public String toString() {
        return this.fz+"/"+this.fm;
    }
    public static void main(String[] args) {
        Fraction fs1=new Fraction(1, 3);    // 1/3
        Fraction fs2=new Fraction(2, 5);    // 2/5
        System.out.println(fs1.toString());
        System.out.println(fs2); //the same as fs2.toString();
        Fraction fs;
        fs=fs1.add(fs2);
        System.out.println("add: "+fs);
        // insert your codes here
```

```
        fs=Fraction.multiply(fs1, fs2);
        System.out.println("multiply: "+fs);
        // insert your codes here
    }
}
```

[Sample]



5. A number of the form *a*+*b*i is called a complex number. Please define class Complex so that it can add, subtract, multiply and divide complex numbers and output the results.

[Sample]