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Homework #2

Due: March 9th 2017

Question 1:

```java
package homework2_1;

import java.util.Arrays;

public class homework2_1 {

    int [][] employee_sum = new int[2][];
    public static void main(String[] args){
        int[][] hours = new int[][]{
                { 2, 4, 3, 4, 5, 8, 8 },
                { 7, 3, 4, 3, 3, 4, 4 },
                { 3, 3, 4, 3, 3, 2, 2 },
                { 9, 3, 4, 7, 3, 4, 1 },
                { 3, 5, 4, 3, 6, 3, 8 },
                { 3, 4, 4, 6, 3, 4, 4 },
                { 3, 7, 4, 8, 3, 8, 4 },
                { 6, 3, 5, 9, 2, 7, 9 }
            };

        int [][] sum_hours = emp_sum(hours);
        int [][] employee_sort = emp_sort(sum_hours);
        print_hours(employee_sort);

    }

    public static int[][] emp_sum (int[][] hours){

        int[][] sum_hours = new int [2][hours.length];

        for (int i=0; i<hours.length; i++){
            int sum = 0;
            for (int ii=0; ii<hours[0].length; ii++){
                sum = sum + hours[i][ii];
            }
            sum_hours [0][i] = sum;
            sum_hours [1][i] = i;
        }
        return sum_hours;
    }

    public static int[][] emp_sort(int[][] array) {

        int step = array[0].length;
        int temp_max = array[0][0];
        int temp_emp = array[1][0];
        int temp_pos = 0;

        while(step>1){
            temp_max = array[0][0];
                temp_emp = array[1][0];
                temp_pos = 0;
```

```java
            for (int i=1; i<step; i++){
                if (array[0][i] > temp_max){
                        temp_max = array[0][i];
                    temp_emp = array[1][i];
                    temp_pos = i;
                }
            }
            array[0][temp_pos] = array[0][step-1];
            array[1][temp_pos] = array[1][step-1];

            array[0][step-1] = temp_max;
            array[1][step-1] = temp_emp;

            step--;
        }
            /*
        if (n == 0) // Base case
          return array;
        for (int count = n; count>0; count--){
          if (array[0][n-1]>temp_max){
                temp_max = array[0][n-1];
                temp_emp = array[1][n-1];
                temp_pos = count;
          }
        }
        int temp1 = array[0][n];
        int temp2 = array[1][n];

        array[0][n] = temp_max;
        array[1][n] = temp_emp;

        array[0][temp_pos] = temp1;
        array[1][temp_pos] = temp2;
        */
        return array; // Recursive call
      }

    public static void print_hours(int[][] employee_sort) {
          System.out.println("The employees hours are sorted as below:");

          for (int i=0; i<employee_sort[0].length;i++){
                System.out.println("Employee# " + employee_sort[1][i] + " with "
 + employee_sort[0][i] + " hours");
                }
            }
        }
```
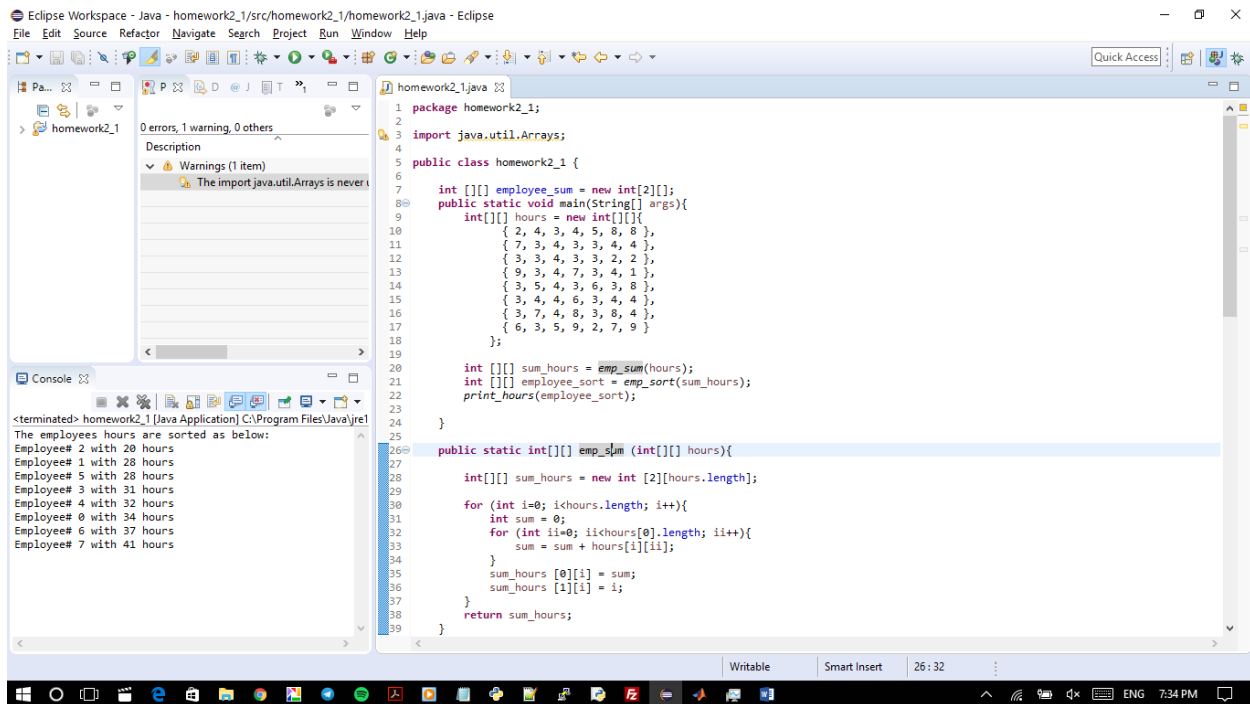
Question 1 Output:

Question 2:

```java
package homework2_2;

import java.util.*;

public class homework2_2 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter matric 1: ");
        String input1 = input.nextLine();
        System.out.print("Enter matric 2: ");
        String input2 = input.nextLine();

        size_check(stringSize(input1), stringSize(input2));

        double[][] MAT_1 = strinToMatrix(input1);
        double[][] MAT_2 = strinToMatrix(input2);
        double[][] multi = mat_multiply (MAT_1, MAT_2);

        System.out.println("The products of Matric#1: ");
        print_mat(MAT_1);
        System.out.println("And Matric#2: ");
        print_mat(MAT_2);
        System.out.println("is: ");
        print_mat(multi);
    }

    public static int stringSize (String input){
        String[] inputString = input.split(" ");
        return inputString.length;
    }

    public static void size_check (int MAT1_size, int MAT2_size){
        if (MAT1_size != MAT2_size){
            System.out.println(" Matrix size do not match");
            }
        if ((int) Math.sqrt(MAT1_size) != Math.sqrt(MAT2_size)){
            System.out.println(" Matrix 1 not square");
            }
        if ((int) Math.sqrt(MAT1_size) != Math.sqrt(MAT2_size)){
            System.out.println(" Matrix 2 not square");
            }
    }


    public static double[][] strinToMatrix (String input){

        String[] inputString = input.split(" ");
        double[] matric = new double[inputString.length];
        for (int i=0; i<inputString.length; i++){
          matric[i] = Double.parseDouble(inputString[i]);
        }
```

```java
        int N = (int)Math.sqrt(matric.length);
            double[][] result = new double[N][N];
            int counter = 0;
            for (int i=0; i<N; i++){
                    for (int ii=0; ii<N; ii++){
                            result[i][ii] = matric[counter];
                            counter++;
                    }
            }
            return result;
    }

    public static void print_mat (double[][] MAT){
            for (int i=0; i<MAT.length;i++){
            for (int ii=0; ii<MAT.length;ii++){
                        System.out.print(MAT[i][ii]+ ", ");
            }
            System.out.println(" ");
        }
    }

    public static double[][] mat_multiply (double[][] MAT_1, double[][] MAT_2){
            int N = MAT_1.length;
            double[][] result = new double[N][N];
            for (int row=0; row<N; row++ ){
                    for (int column=0; column<N; column++ ){
                            double sum = 0;
                            for (int i=0; i<N; i++){
                                    sum = sum + MAT_1[row][i]*MAT_2[i][column];
                            }
                            result [row][column] = sum;
                    }
            }
            return result;
    }
}
```

Question 2 Output:


```java
package homework2_2;

import java.util.*;

public class homework2_2 {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter matric 1: ");
        String input1 = input.nextLine();
        System.out.print("Enter matric 2: ");
        String input2 = input.nextLine();

        size_check(stringSize(input1), stringSize(input2));

        double[][] MAT_1 = strinToMatrix(input1);
        double[][] MAT_2 = strinToMatrix(input2);
        double[][] multi = mat_multiply (MAT_1, MAT_2);

        System.out.println("The products of Matric#1: ");
        print_mat(MAT_1);
        System.out.println("And Matric#2: ");
        print_mat(MAT_2);
        System.out.println("is: ");
        print_mat(multi);
    }

    public static int stringSize (String input){
        String[] inputString = input.split(" ");
        return inputString.length;
    }

    public static void size_check (int MAT1_size, int MAT2_size){
        if (MAT1_size != MAT2_size){
            System.out.println(" Matrix size do not match");
        }
        if ((int) Math.sqrt(MAT1_size) != Math.sqrt(MAT2_size)){
            System.out.println(" Matrix 1 not square");
        }
        if ((int) Math.sqrt(MAT1_size) != Math.sqrt(MAT2_size)){
```

Console output:

```
<terminated> homework2_2 [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javav
Enter matric 1: 1 2 3 4
Enter matric 2: 1 2 3 4
The products of Matric#1:
1.0, 2.0,
3.0, 4.0,
And Matric#2:
1.0, 2.0,
3.0, 4.0,
is:
7.0, 10.0,
15.0, 22.0,
```

Question 3:

```java
// Homework 2_3

public class Fan {

    public static void main(String[] args){
        Fan myfan1 = new Fan(3, true, 10, "Yellow");
        Fan myfan2 = new Fan(2, false, 5, "bulue");
        System.out.println(myfan1.toString());
        System.out.println(myfan2.toString());


    }

    private int speed; // 1 is SLOW, 2 is MEDIUM, 3 is FAST
    private boolean weather;
    private double radius;
    private String color;

    public Fan(){
        this.speed = 1;
        this.weather = false;
        this.radius = 5;
        this.color = "blue";
    }

    public Fan(int speed, boolean x, double radius, String y){
        this.speed = speed;
        this.weather = x;
        this.radius = radius;
        this.color = y;
    }


    public void set_speed(int x){
        if (x==1 || x==2 || x==3){
            this.speed = x;
        } else {
            System.out.println("Invalid Speed Input");
        }
    }

    public int get_speed(){
        return this.speed;
    }


    public void set_weather(boolean x){
        if (x==true || x==false){
            this.weather = x;
        } else {
            System.out.println("Invalid Weather Input");
        }
    }
```

```java
        public boolean get_weather(){
                return this.weather;
        }

        public void set_radius(double x){
                if (x>0){
                        this.radius = x;
                } else {
                    System.out.println("Invalid radius Input");
                }
        }

        public double get_radius(){
                return this.radius;
        }


        public void set_color(String x){
                this.color = x;
        }

        public String get_color(){
                return this.color;
        }

        @Override
        public String toString(){
                if (this.weather == true){
                        return "The fan is on. The speed is " + this.speed + " and the
color is " + this.color + " and the radius is " + this.radius;
                } else {
                        return "The fan is iff. The speed is " + this.speed + " and the
color is " + this.color + " and the radius is " + this.radius;
                }

        }

}
```
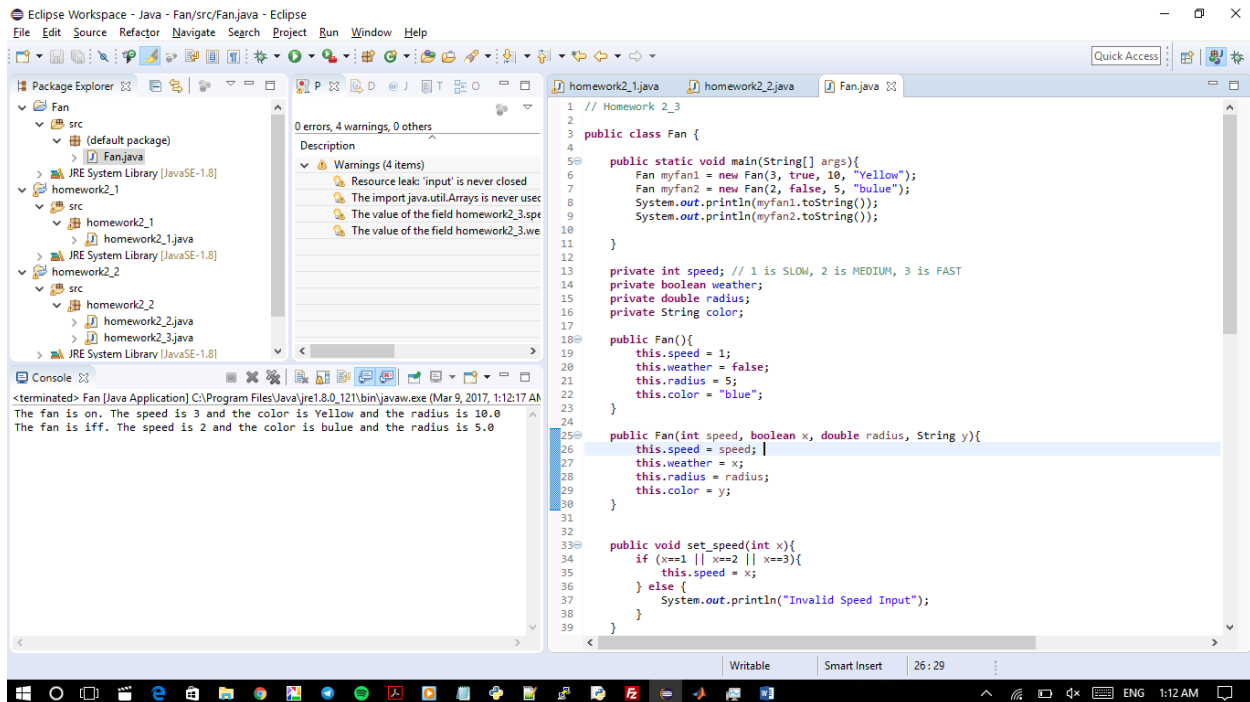
Question 3 Output:

Question 4a:

```java
package homework2_4a;



class Animal {
    void walk(){
        System.out.println("I am walking");
    }
}
class Bird extends Animal{
    void fly(){
        System.out.println("I am flying");
    }
}

public class Solution{
    public static void main(String[] args){
        Bird bird = new Bird();
        bird.walk();
        bird.fly();
    }
}
```

The main takes an instance of the Bird class and Bird is a subclass of Animal which inherit the properties of the Animal class. Once the bird.fly is invoked, it is there in the bird class so it is not a problem. Once the bird.walk is invoked, there is no walk method in the bird class. Since Bird is a subclass, the program goes one step up and search for the walk in the super class and see if it is there and of course walk is there in the Animal class. This it is invoked.

Question 4a Output:
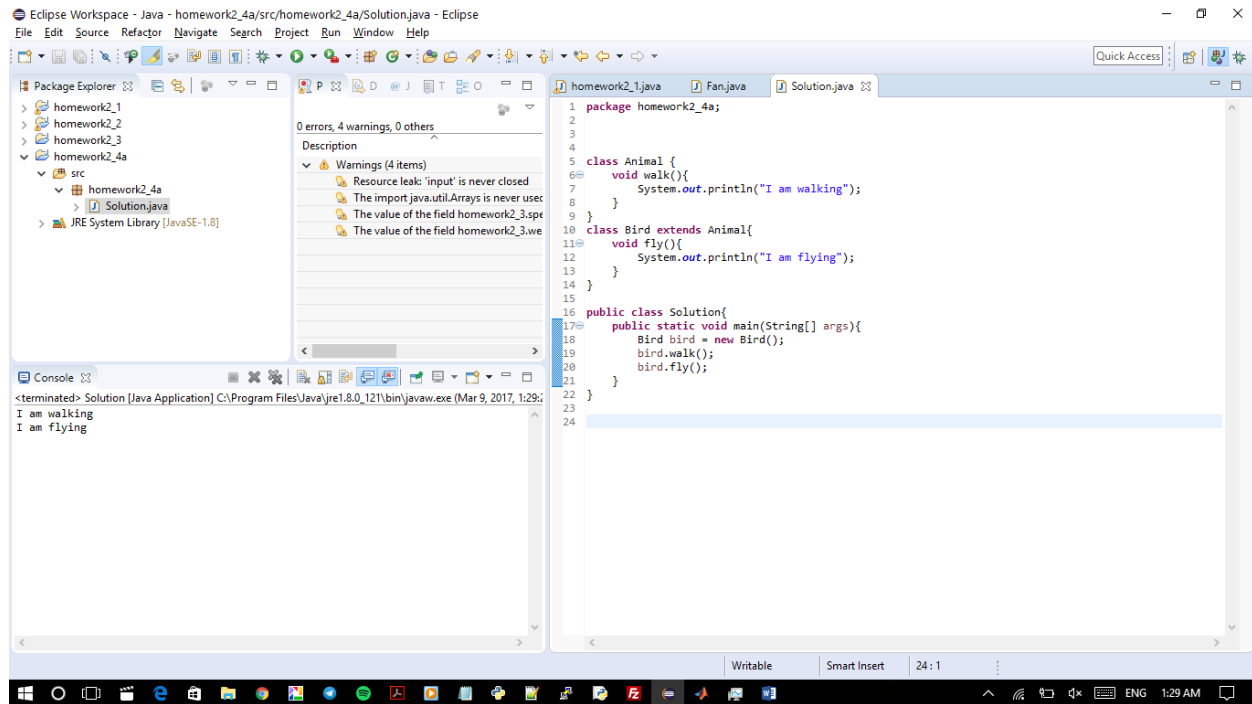
Question 4b:

```java
package homework2_4;

public class Test {
    public static void main(String[] args){
        System.out.println("Hi, ABC, good".matches("ABC "));  // see if the two strings match
        System.out.println("Hi, ABC, good".matches(".*ABC.*"));  //see if the second sting matches with anything in the first string
        System.out.println("A,B;C".replaceAll(",;","#"));  // replace string ",;" with "#". Well there is no ",;" string so the result is the same
        System.out.println("A,B;C".replaceAll("[,;]","#"));   // replace string/character "," and ";" with "#". Now you can find them and replace

        String[] tokens = "A.B:C".split("[.:]");  // this part splits the String once "." is ":" is detected and then print with a space in between
        for (int i = 0; i < tokens.length; i++){
            System.out.print(tokens[i] + " ");
        }
    }
}
```

Question 4b Output:
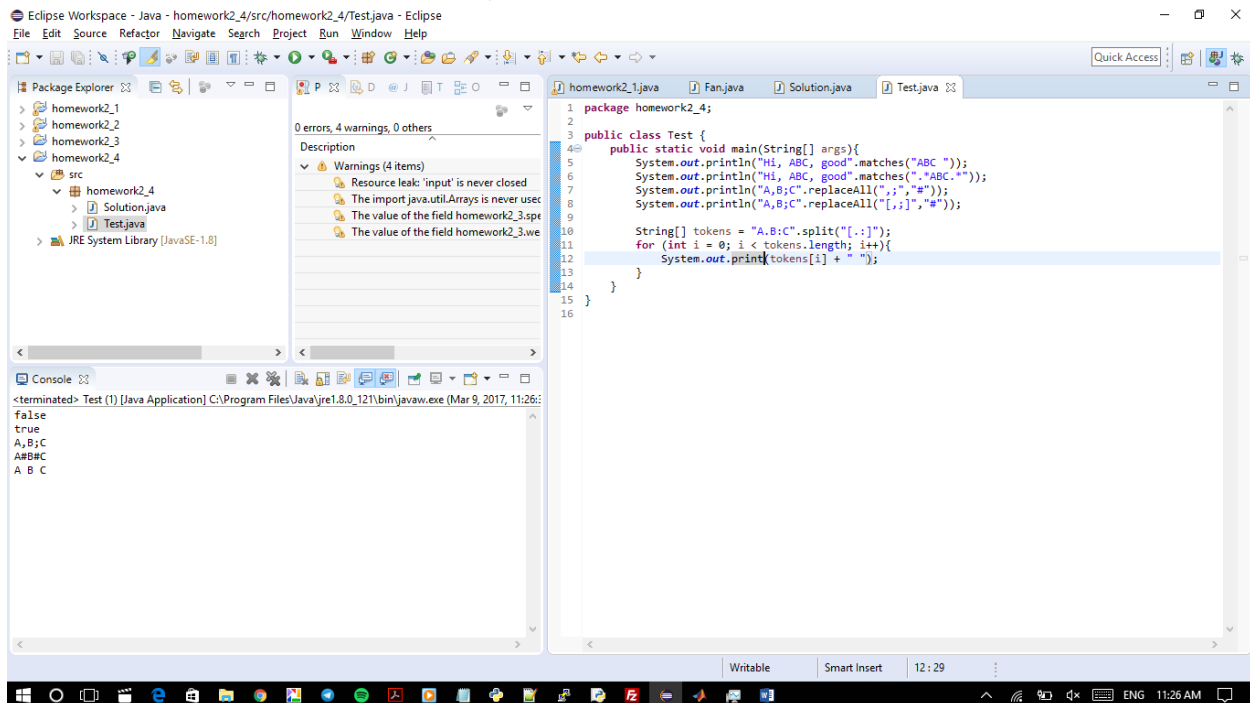
Question 4c:

```java
package homework2_4;

public class Test2 {
    public static void main(String[] args){
        new Person().printPerson();
        new Student().printPerson();
    }
}

class Student extends Person{
    private String getInfo(){
        return "Student";
    }
}

class Person{
    private String getInfo(){
        return "Person";
    }
    public void printPerson(){
        System.out.println(getInfo());
    }

}
```
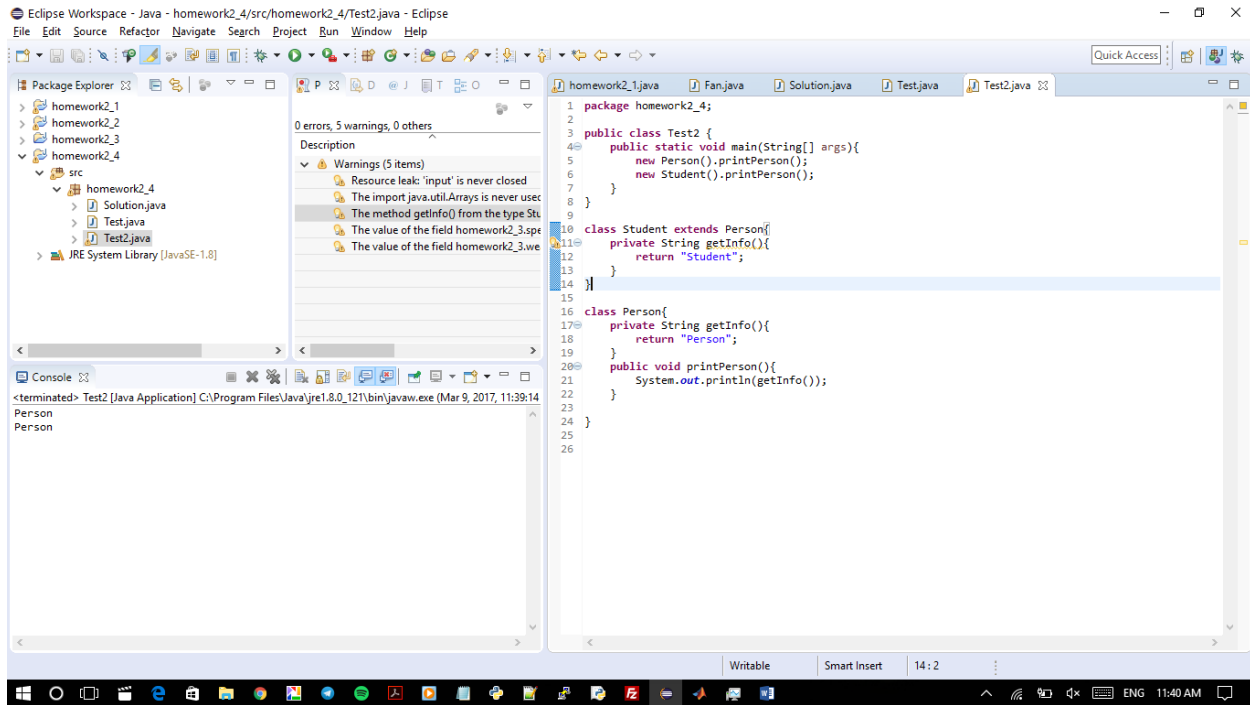
The class Person is a superclass and the class Student is a subclass. Once `new Person().printPerson()`is invoked, a new instance of "Person" is taken and then it prints the result. The result is `return "Person"` which is directly mentioned in the same class. In the second line, once `new Student().printPerson()` is invoked, a new object using class "Student" is made and the result is printed. In this one, however, the method is not in the subclass, thus the program goes to the superclass and search there. Well, the method is there and once invoked it invokes the method "getInfo" which is in the same class (super class) not the original class (subclass). Thus, both lines print Person.

Question 4c Output:

Question 5:

```java
package homework2_5;
import java.util.Scanner;

public class homework2_5 {
    public static void main (String[] args){
        Scanner input = new Scanner(System.in);
        System.out.println("Enter a String: ");
        String input_string = input.nextLine();

        System.out.println("Enter a charachter to find: ");
        char input_char = input.next().charAt(0);

        int result = count(input_string,input_char,input_string.length()-1);
        System.out.println("The number of occurance of ( " + input_char + " ) in
( " +input_string + " ) is ( " + result+ " ) times" );
    }

    public static int count(String input_string, char input_char, int n ){
        int counter = 0;
        if (n<0){
            return 0;
        }
        if (input_string.charAt(n)==input_char){
            counter = 1;
        }
        return counter+count(input_string,input_char,n-1);
    }
}
```
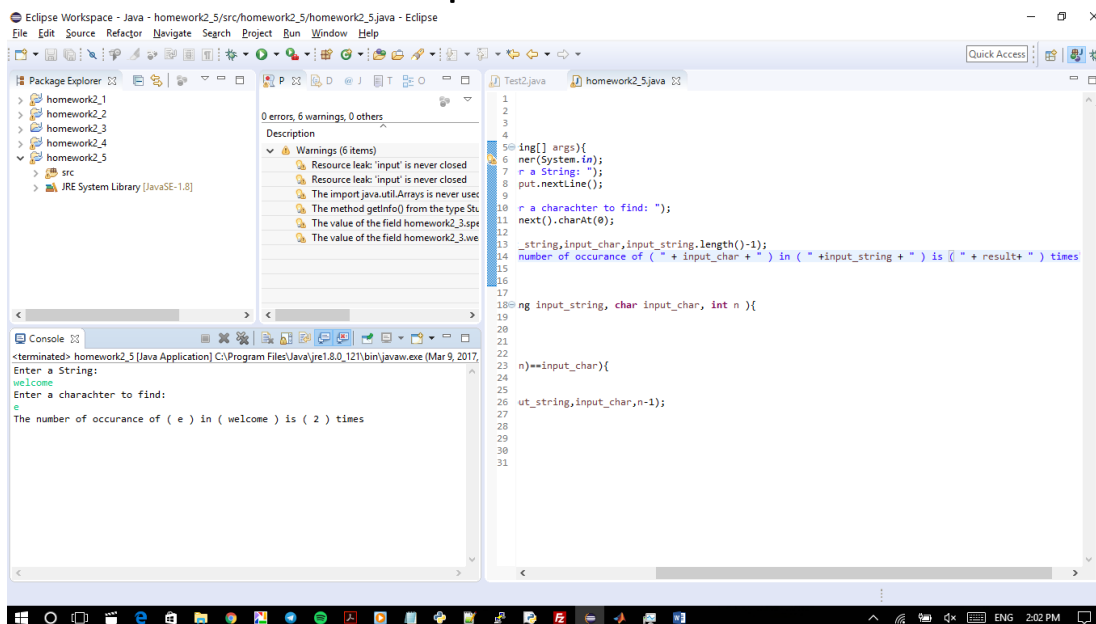
Question 5 Output:

Question 6:

```java
package homework2_6;
import java.util.Scanner;

public class homework2_6 {
    public static void main (String[] args){
        Scanner input = new Scanner(System.in);
        System.out.println("Enter a number: ");
        String input_string = input.nextLine();

        long num = Long.parseLong(input_string);
        long sum = count(num);
        System.out.println("The sum of digits of ( " + input_string + " ) is ( "
+ sum + " )");
    }

    public static long count(long num){

        long rest = num/10;
        long remainder = num%10;
        if (rest == 0){
            return remainder;
        }
        return remainder + count(rest);
    }
}
```

Question 6 Output: