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Homework #2
Due: March 9th 2017

Question 1:

```
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;
```

```

        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;

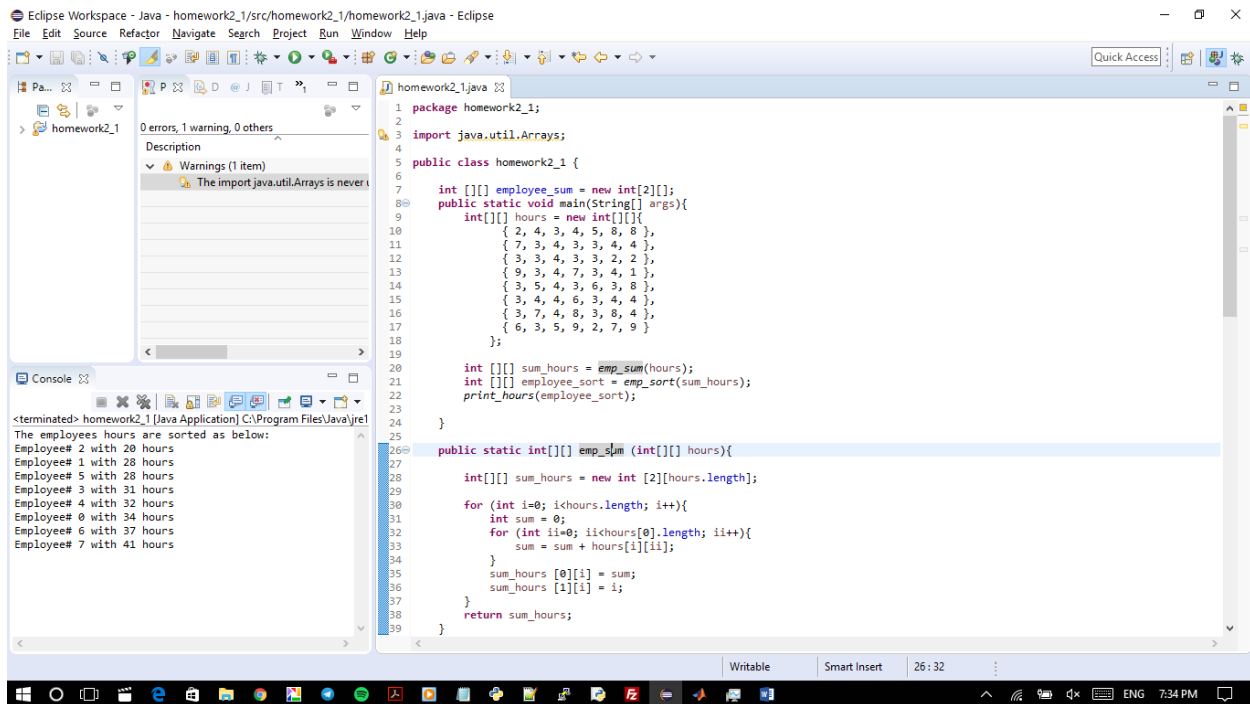
    array[0][temp_pos] = temp1;
    array[1][temp_pos] = temp2;
    */
    return array; // Recursive call
}

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:



The screenshot shows the Eclipse IDE with a Java project named 'homework2_1'. The main editor displays the source code for 'homework2_1.java'. The code defines a class 'homework2_1' with a 'main' method and a static method 'emp_sum'. The 'main' method initializes an array of employee hours and calls 'emp_sum' to calculate the total hours. The 'emp_sum' method iterates through the array and calculates the sum. The console output shows the result of the program execution.

```
1 package homework2_1;
2
3 import java.util.Arrays;
4
5 public class homework2_1 {
6
7     int [][] employee_sum = new int[2][];
8     public static void main(String[] args){
9         int[][] hours = new int[][]{
10             { 2, 4, 3, 4, 5, 8, 8 },
11             { 7, 3, 4, 3, 3, 4, 4 },
12             { 3, 3, 4, 3, 3, 2, 2 },
13             { 9, 3, 4, 7, 3, 4, 1 },
14             { 3, 5, 4, 3, 6, 3, 8 },
15             { 3, 4, 4, 6, 3, 4, 4 },
16             { 3, 7, 4, 8, 3, 8, 4 },
17             { 6, 3, 5, 9, 2, 7, 9 }
18         };
19
20         int [][] sum_hours = emp_sum(hours);
21         int [][] employee_sort = emp_sort(sum_hours);
22         print_hours(employee_sort);
23     }
24
25     public static int[][] emp_sum (int[][] hours){
26
27         int[][] sum_hours = new int [2][hours.length];
28
29         for (int i=0; i<hours.length; i++){
30             int sum = 0;
31             for (int ii=0; ii<hours[0].length; ii++){
32                 sum = sum + hours[i][ii];
33             }
34             sum_hours [0][i] = sum;
35             sum_hours [1][i] = i;
36         }
37         return sum_hours;
38     }
39 }
```

Console Output:

```
<terminated> homework2_1 [Java Application] C:\Program Files\Java\jre1...
The employees hours are sorted as below:
Employee# 2 with 20 hours
Employee# 1 with 28 hours
Employee# 5 with 28 hours
Employee# 3 with 31 hours
Employee# 4 with 32 hours
Employee# 0 with 34 hours
Employee# 6 with 37 hours
Employee# 7 with 41 hours
```

Question 2:

```
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 matrix 1: ");
        String input1 = input.nextLine();
        System.out.print("Enter matrix 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]);
        }
    }
}
```

```

    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:

The screenshot shows the Eclipse IDE with a Java project named 'homework2_2'. The main editor displays the source code for 'homework2_2.java'. The code defines a package, imports 'java.util.*', and contains a 'main' method that takes command-line arguments. It uses a 'Scanner' to read two matrices from the user, converts them to double arrays, and then multiplies them. It also includes a 'size_check' method to verify if the matrices are square and of compatible sizes for multiplication. The console output shows the execution of the program, where two 3x3 matrices are entered, and their product is calculated and displayed.

```
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 matrix 1: ");
        String input1 = input.nextLine();
        System.out.print("Enter matrix 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 Matrix#1: ");
        print_mat(MAT_1);
        System.out.println("And Matrix#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\javaw
Enter matrix 1: 1 2 3 4
Enter matrix 2: 1 2 3 4
The products of Matrix#1:
1.0, 2.0,
3.0, 4.0,
And Matrix#2:
1.0, 2.0,
3.0, 4.0,
is:
7.0, 10.0,
15.0, 22.0,
```

Question 3:

// 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, "blue");
        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");
        }
    }
}
```



```

    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;
    }

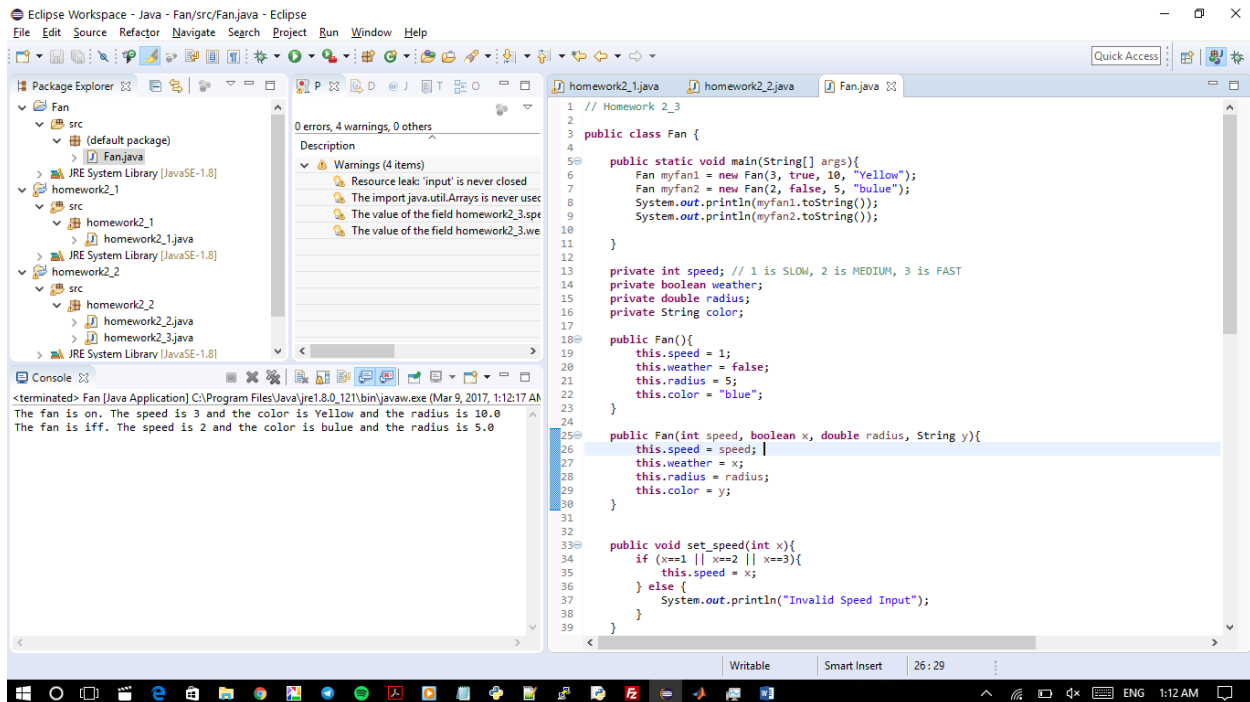
    public void set_color(String x){
        this.color = x;
    }

    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:



The screenshot shows the Eclipse IDE interface. The Package Explorer on the left displays the project structure: 'Fan' (src) and 'homework2_1' (src). The Console window at the bottom shows the output of the Java application. The main editor window displays the code for 'homework2_1.java'.

```
1 // Homework 2_3
2
3 public class Fan {
4
5     public static void main(String[] args){
6         Fan myfan1 = new Fan(3, true, 10, "Yellow");
7         Fan myfan2 = new Fan(2, false, 5, "blue");
8         System.out.println(myfan1.toString());
9         System.out.println(myfan2.toString());
10    }
11
12
13    private int speed; // 1 is SLOW, 2 is MEDIUM, 3 is FAST
14    private boolean weather;
15    private double radius;
16    private String color;
17
18    public Fan(){
19        this.speed = 1;
20        this.weather = false;
21        this.radius = 5;
22        this.color = "blue";
23    }
24
25    public Fan(int speed, boolean x, double radius, String y){
26        this.speed = speed;
27        this.weather = x;
28        this.radius = radius;
29        this.color = y;
30    }
31
32
33    public void set_speed(int x){
34        if (x==1 || x==2 || x==3){
35            this.speed = x;
36        } else {
37            System.out.println("Invalid Speed Input");
38        }
39    }
40 }
```

Console Output:

```
<terminated> Fan [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe (Mar 9, 2017, 1:12:17 AM)
The fan is on. The speed is 3 and the color is Yellow and the radius is 10.0
The fan is off. The speed is 2 and the color is blue and the radius is 5.0
```

Question 4a:

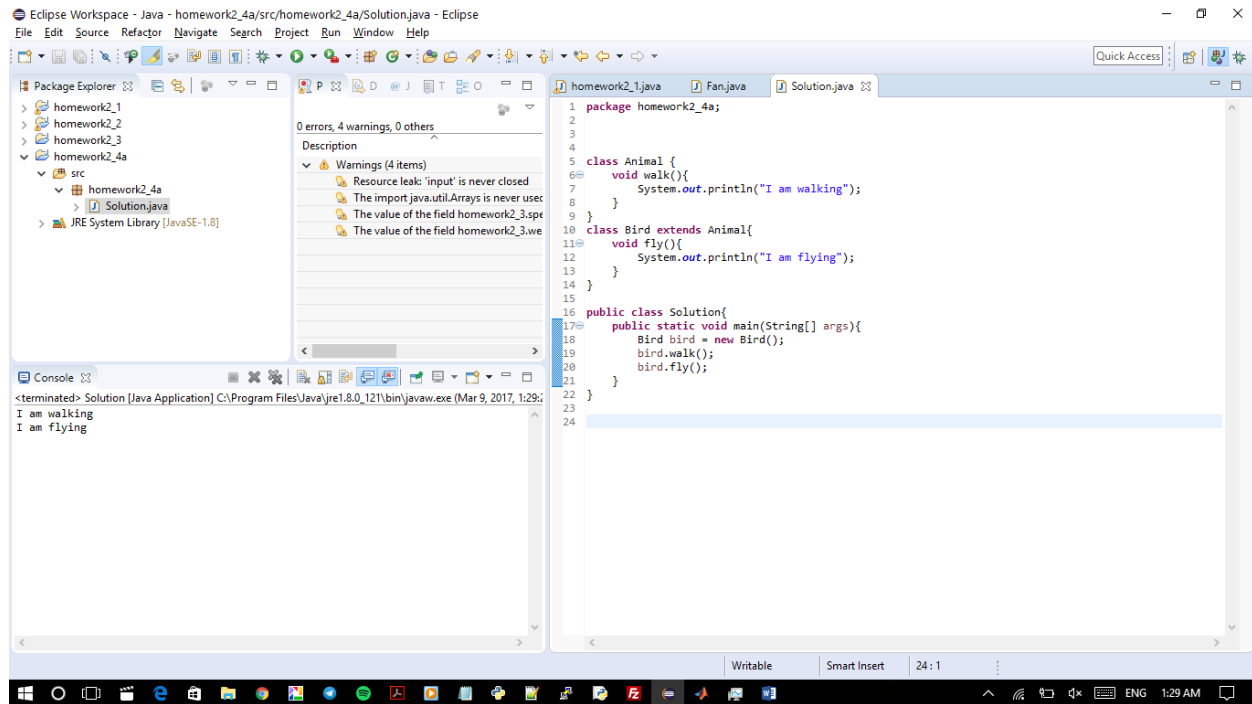
```
package homework2_4a;
```

```
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:

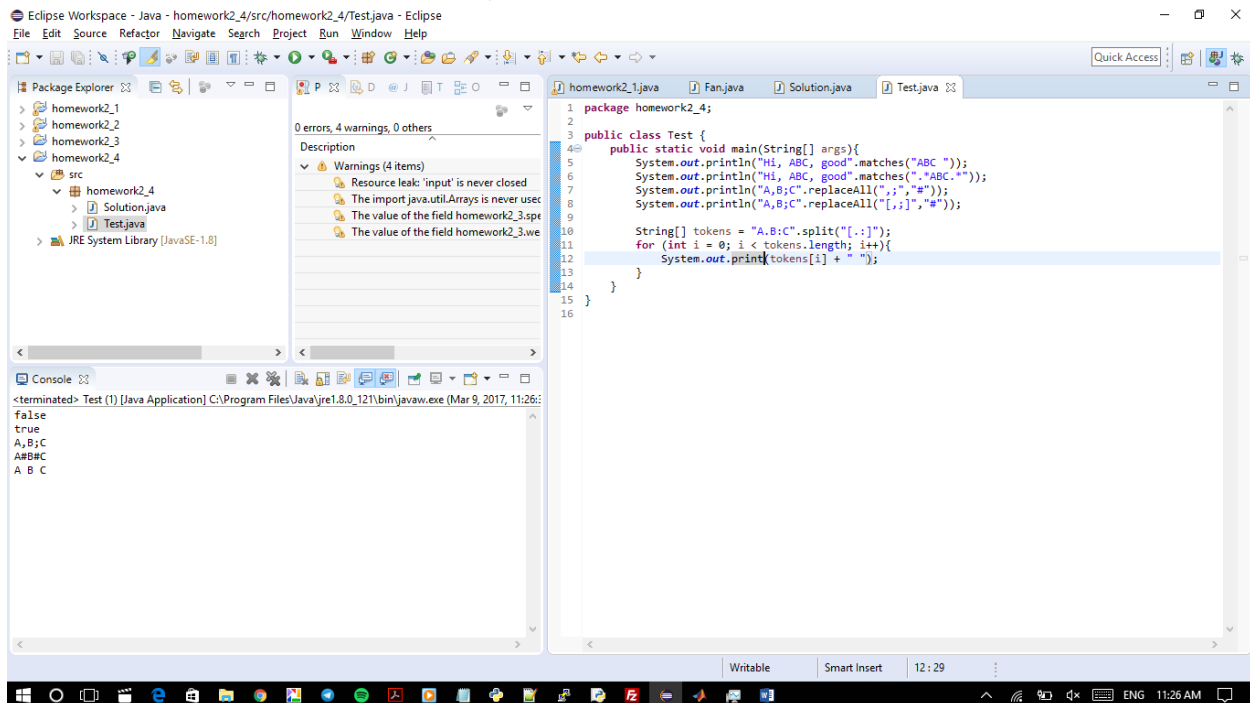


Question 4b:

```
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:

```
package homework2_4;

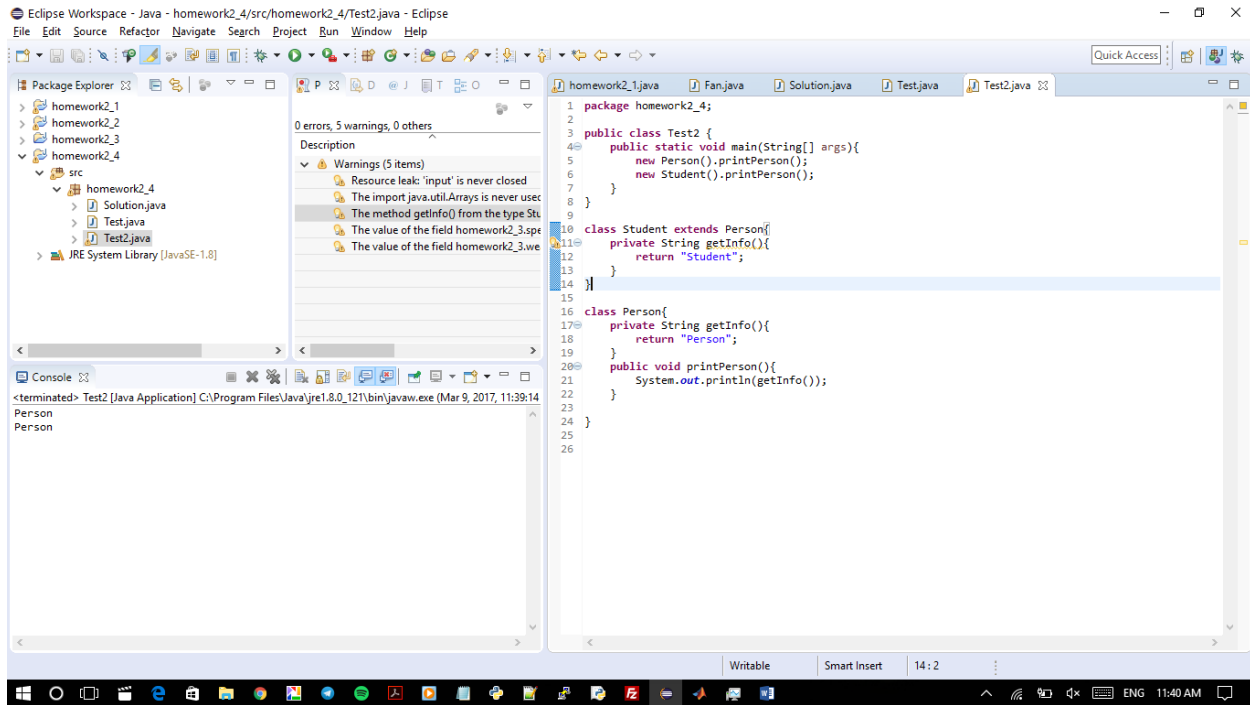
public class Test2 {
    public static void main(String[] args){
        new Person().printPerson();
        new Student().printPerson();
    }
}

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:



The screenshot shows the Eclipse IDE interface. The Package Explorer on the left displays a project structure with folders homework2_1, homework2_2, homework2_3, and homework2_4. The homework2_4 folder is expanded, showing a src folder containing Solution.java, Test.java, and Test2.java. The Test2.java file is selected. The central editor shows the code for Test2.java, which includes a main method that creates a Person object and a Student object, and a Student class that extends Person. The console at the bottom shows the output of the program, which is "Person" printed twice. The status bar at the bottom indicates the file is writable and the cursor is at line 14, column 2.

```
1 package homework2_4;
2
3 public class Test2 {
4     public static void main(String[] args){
5         new Person().printPerson();
6         new Student().printPerson();
7     }
8 }
9
10 class Student extends Person{
11     private String getInfo(){
12         return "Student";
13     }
14 }
15
16 class Person{
17     private String getInfo(){
18         return "Person";
19     }
20     public void printPerson(){
21         System.out.println(getInfo());
22     }
23 }
24
25
26
```

Console Output:

```
<terminated> Test2 [Java Application] C:\Program Files\Java\jre1.8.0_121\bin\javaw.exe (Mar 9, 2017, 11:39:14)
Person
Person
```

Question 5:

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

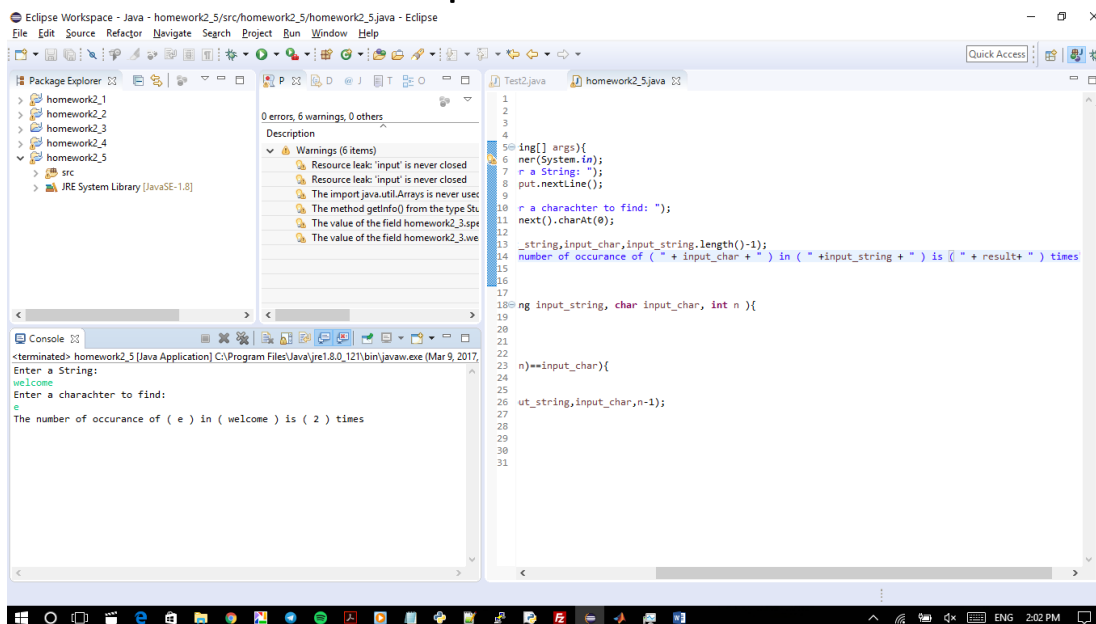
public class homework2_5 {
    public static void main (String[] args){
        Scanner input = new Scanner(System.in);
        System.out.println("Enter a String: ");
        String input_string = input.nextLine();

        System.out.println("Enter a character 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 occurrence 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:

```
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:

