


Programming – Mid-semester Exam November 2013	 Universidad Carlos III de Madrid
Bachelor's degree in Computer Science and Engineering	

READ CAREFULLY THESE INSTRUCTIONS BEFORE STARTING THE EXAM:

- Fill in all the pages with a pen (personal data and answers)
- Do not use a pencil or a red pen
- Do not forget your NIA and your actual group
- The duration of this exam is 1 hour and 30 minutes
- Use only these sheets for the answers. Use the back of the pages if needed. Additional sheets will not be considered

DO NOT CONTINUE WITH THE NEXT PAGE until indicated

<i>Surname</i>	<i>Name</i>	
<i>Signature</i>	<i>NIA</i>	<i>Group</i>

Question 1 (1 Point).- **Find and explain** the four compilation or runtime errors existing in the following Java code. How can they be solved? (line numbers are provided for convenience)

```

1. public static void main(String[] args) {
2.     int counter;
3.     int temp = 0;
4.     double [] d;
5.     while (counter <10){
6.         float f = temp++;
7.         d [temp-1]= f*f;
8.     }
9.     if (f%2==0){
10.        System.out.println("Even");
11.    }
12.    else {
13.        System.out.println("Odd");
14.    }
15.    for (int temp=10; temp>0; temp++){
16.        System.out.println(temp);
17.    }
18. }

```

Solution:

Line 5: the variable `counter` is used but it has not been initialized. To solve it, an initial value must be assigned in line 2.

Line 7: the array `d` is used but it has not been created. To solve it, a dimension for the array should be specified in line 4.

Line 9: the variable `f` has been declared inside the `while` loop (line 6), once the loop ends it does not exist anymore. To solve it, it should be declared outside the loop (before line 5)

Line 15: the variable `temp` is declared twice (previously in line 3). To solve it, we can change the name of the `for` control variable or just initialize it (`for (temp = 10; ...)`), without declaring it twice.

Problem 1 (1.5 Points).- Create an irregular matrix of `boolean`. It will have 4 rows with 25, 30, 35 and 40 columns respectively. All elements but the first and last element of each row must be set to false (**use** a loop, the code must work for any matrix despite its length). Print the matrix separating elements on the same row using a tab.

```

public class Problem1 {
    public static void main(String[] args) {
        boolean [][] matrix = new boolean [4][];
        matrix[0] = new boolean [25];
        matrix[1] = new boolean [30];
        matrix[2] = new boolean [35];
        matrix[3] = new boolean [40];
        //By default all elements are false, so we only have to set
        //to true the first and last element of each row
        for (int rows=0; rows<matrix.length; rows++){
            matrix[rows][0]=true;
            matrix[rows][matrix[rows].length-1]=true;
        }
        for (int rows=0; rows<matrix.length; rows++){
            for (int cols=0; cols<matrix[rows].length; cols++){
                System.out.print(matrix[rows][cols]+"\\t");
            }
            System.out.println();
        }
    }
}

```

Problem 2 (1.5 Points).- Create the enum type Geometry to store the following elements: TRIANGLE, SQUARE, PENTAGON, HEXAGON, HEPTAGON, OCTAGON. Ask the user on keyboard the name of the figure and print the number of sides it has. Use a switch.

Note: to read an enum on the keyboard we need to read a String and convert it into an enum as follows:
 Geometry myFig = Geometry.valueOf(String)

```
import java.util.Scanner;

public class Problem2 {
    enum Geometry {TRIANGLE, SQUARE, PENTAGON, HEXAGON, HEPTAGON, OCTAGON}
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the name of the figure");
        String name = sc.next();
        Geometry figure = Geometry.valueOf(name);
        switch (figure){
            case TRIANGLE: System.out.println(3); break;
            case SQUARE: System.out.println(4); break;
            case PENTAGON: System.out.println(5); break;
            case HEXAGON: System.out.println(6); break;
            case HEPTAGON: System.out.println(7); break;
            case OCTAGON: System.out.println(8); break;
        }
        sc.close();
    }
}
```

Problem 3 (2 points).- Create a new class called Shoe with three attributes, color of type String, size of type float and right of type boolean (if it is true it is the right foot's shoe). Values by default should be "no color", 9.5 and true. In a different program create two shoes, ask the user for the values of the attributes and print whether they form a pair or not (two shoes form a pair if their colors and sizes are equal and one is the right shoe and the other the left one)

```
public class Shoe {
    public String color= "no color";
    public float size= 9.5F;
    public boolean right = true;
}

import java.util.Scanner;

public class Problem3 {

    public static void main(String[] args) {
        Shoe s1 = new Shoe(), s2 = new Shoe();
        Scanner sc = new Scanner (System.in);
        System.out.println("Enter the color of the first shoe");
        s1.color = sc.next();
        System.out.println("Enter the color of the second shoe");
        s2.color = sc.next();
        System.out.println("Enter the size of the first shoe");
        s1.size = sc.nextFloat();
        System.out.println("Enter the size of the second shoe");
        s2.size = sc.nextFloat();
        System.out.println("Is the first shoe the right shoe?");
        s1.right = sc.nextBoolean();
        System.out.println("Is the second shoe the right shoe?");
        s2.right = sc.nextBoolean();
        if (s1.color.equals(s2.color) && (s1.size == s2.size) && (s1.right !=
s2.right))
            System.out.println("They are a pair");
        else
            System.out.println("They are not a pair");
        sc.close();
    }
}
```

Problem 4 (4 Points).- Create a program to calculate which public transportation means is cheaper to commute to work, according to the following specification:

- a) (0.5 points) The program must ask the user how many transportation means are going to be compared. It must check that at least two means are compared, if not, 2 will be selected as the by default value.
- b) (0.5 points) Next it will ask the user for the names of the transportation means and store them in an array.
- c) (0.5 points) The program will also ask how many days a month the user commutes to work. It should be checked that this value is between 1 and 31, if not, 22 will be the by default value.
- d) (1 point) For each transportation means the system will ask the price of the ticket and how many trips can be done with it (0 means unlimited trips a month). The program must calculate the monthly price, store it in an array and print it.
- e) (0.5 points) Once all the prices have been calculated, the system will print the price of the cheapest transportation means and store it (name doesn't need to be printed)
- f) (1 point) Next the system will compare the cheapest public transportation means with the cost of commuting by car. To do that it will ask for the number of kilometers (one way) to go to work, the price of a liter of gas and the number of kilometers travelled by 1 liter of gas. It will print whether it is cheaper to travel by car or by public transportation.

Remark: you can assume the user is always going to provide correct answers.

Example:

How many transportation means do you want to compare?

0

You need to compare at least 2 means!

Enter the name of the transportation means number 0

train

Enter the name of the transportation means number 1

metro

How many days you commute to work?

0

Number of days must be between 1 and 31

Selecting 22 days by default

Which is the ticket's price of train?

13,45

How many trips can be done with this ticket? (0 for monthly unlimited)

10

The monthly price of train is 53.8

Which is the ticket's price of metro?

55

How many trips can be done with this ticket? (0 for monthly unlimited)

0

The monthly price of metro is 55.0

The cheapest monthly price is 53.8

How many km do you travel to work (one way)?

25

What is the price of a liter of gas?

1,3

How many km for a liter?

20

Use car

```
import java.util.Scanner;
```

```
public class Problem4 {
```

```
    public static void main(String[] args) {
```

```
        //a)
```

```
        Scanner sc = new Scanner (System.in);
```

```
        System.out.println("How many transportation means do you want to compare?");
```

```
        int number = sc.nextInt();
```

```
        if (number<2) {
```

```
            System.out.println("You need to compare at least 2 means!");
```

```
            number = 2;
```

```

    }
    //b)
    String [] names = new String [number];
    for (int ii=0; ii<number;ii++){
        System.out.println("Enter the name of the transportation means number
"+ii);

        names[ii]=sc.next();
    }
    //c)
    System.out.println("How many days you commute to work?");
    int days = sc.nextInt();
    if (days<1 || days>31){
        System.out.println("Number of days must be between 1 and 31");
        System.out.println("Selecting 22 days by default");
        days = 22;
    }
    //d)
    float [] monthlyPrices = new float [number];
    float ticketPrice = 0;
    int trips = 0;
    for (int ii=0; ii<number; ii++){
        System.out.println("Which is the ticket's price of "+names[ii]+"?");
        ticketPrice = sc.nextFloat();
        System.out.println("How many trips can be done with this ticket? (0
for monthly unlimited)");
        trips = sc.nextInt();
        if (trips ==0)
            monthlyPrices[ii]= ticketPrice;
        else
            monthlyPrices [ii]= days/trips*2*ticketPrice;
        System.out.println("The monthly price of "+names[ii]+" is
"+monthlyPrices[ii]);
    }
    //e (it can be done also in the previous for)
    float cheapest = monthlyPrices[0];
    for (int ii=1; ii<number; ii++){
        if (monthlyPrices[ii]<cheapest)
            cheapest = monthlyPrices[ii];
    }
    System.out.println("The cheapest monthly price is "+cheapest);
    //f
    System.out.println("How many km do you travel to work (one way)?");
    float km = sc.nextFloat();
    System.out.println("What is the price of a liter of gas?");
    float gas = sc.nextFloat();
    System.out.println("How many km for a liter?");
    float consumption = sc.nextFloat();
    //The car price is twice the price of a single trip by the
    //number of commuting days
    float carPrice = days*km*2*gas/consumption;
    if (carPrice>cheapest)
        System.out.println("Use public transportation");
    else
        System.out.println("Use car");
    sc.close();
}
}

```