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AMERICAN UNIVERSITY OF ARMENIA
College of Science and Engineering
COMP120 Introduction to Object-Oriented Programming

MIDTERM 1 EXAM

Date: Tuesday, February 17 2015
Starting time: 10:30
Duration: 1 hour 20 minutes
Attention: **ANY TYPE OF COMMUNICATION IS STRICTLY PROHIBITED**
Please write down your name at the top of all used pages

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Problem 1

Square arrays can be rotated by 90° , say, in clock-wise direction. For example:

1	2	3	4	5	→	21	16	11	6	1
6	7	8	9	10		22	17	12	7	2
11	12	13	14	15		23	18	13	8	3
16	17	18	19	20		24	19	14	9	4
21	22	23	24	25		25	20	15	10	5

The easiest way to implement the rotation by 90° is to transpose the initial square array and then to reverse all its rows separately. Write a Java method `void rotate(int[][] array2D)` that takes as its argument a square `int[][] array2D` and rotates its. Use already implemented methods `void reverse(int[] array1D)` and `void transpose(int[][] array2D)`:

```
public static void reverse(int[] array1D) {  
    for (int i = 0; i < array1D.length / 2; i++) {  
        array1D[array1D.length - 1 - i] += array1D[i];  
        array1D[i] = array1D[array1D.length - 1 - i] - array1D[i];  
        array1D[array1D.length - 1 - i] -= array1D[i];  
    }  
}  
  
public static void transpose(int[][] array2D) {  
    for (int row = 0; row < array2D.length; row++)  
        for (int col = row + 1; col < array2D.length; col++) {  
            array2D[row][col] += array2D[col][row];  
            array2D[col][row] = array2D[row][col] - array2D[col][row];  
            array2D[row][col] -= array2D[col][row];  
        }  
}
```

```
public static void  
    for (int i=0, i < array.length, i++)  
        for (int j=0, j < array.length, j++)  
            array[i][j] = transpose(array[i][j]);  
    for (int i=0, i < array.length, i++)  
        array[i] reverse(array[i]);
```

{

4/2 = 2

see ShS

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Problem 2

Colors in Java can be represented by objects of type *Color*. Each such object contains the *red*, *green* and *blue* components of the corresponding color as integer values from 0 to 255. Consider below a Java code that creates and initializes a rectangular array of *Color* type:

```
import java.util.Scanner;
import java.awt.Color;

public class Colors {

    public static void main(String args[]) {
        Scanner in = new Scanner(System.in);

        // Read number of rows and columns and create a Color array of such size
        Color[][] c = new Color[in.nextInt()][in.nextInt()];

        // For each element read the red, green and blue components as integers and
        // create a Color object by calling Color(int, int, int) constructor
        for (int row = 0; row < c.length; row++)
            for (int col = 0; col < c[0].length; col++)
                c[row][col] = new Color(in.nextInt(), in.nextInt(), in.nextInt());

        // TO BE CONTINUED
    }
}
```

Continue with a Java code that creates another array *Color[][] g* of the same size and fills it with gray equivalents of the colors from the array *Color[][] c*. To get a gray equivalent of a given color *c[i][j]*, it is enough to construct a *Color* object, whose red, green and blue components all are equal to the calculated average of red, green and blue components of the initial *c[i][j]*. Use *int getRed()*, *int getGreen()* and *int getBlue()* methods of class *Color*.

```
Color[][] g = new Color[c.length][c.length]
int k = 0
for (int i = 0; i < g.length; i++)
    for (int j = 0; j < g.length; j++) {
        k = new Color(getRed(c[i][j]), getGreen(c[i][j]), getBlue(c[i][j]))
        g[i][j] = new Color(k, k, k)
    }
```

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See ShS

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