Name and, if possible, ID#.[redacted]

AMERICAN UNIVERSITY OF ARMENIA

College of Science and Engineering

COMP120 Introduction to Object-Oriented Programming

MIDTERM 2 EXAM

Date: Tuesday, March 24 2015

Starting time: 10:30

Duration: 1 hour 20 minutes

Attention: **ANY COMMUNICATION IS STRICTLY PROHIBITED**

Please write down your name at the top of all used pages

2/15

Problem 1

The easiest way to implement rotation by **90^0** of a square array is to transpose it and then reverse all its rows separately. Write a C++ function ***void rotate(int *a2D, int size)*** that takes as its argument a pointer to the first element of a square array ***int *a2D*** of the specified ***int size*** and rotates its. Use already implemented functions ***void reverse(int a1D[], int length)*** and ***void transpose(int *a2D, int size)***:

```
void reverse(int a1D[], int length)
{
      for (int i = 0; i < length / 2; i++)
            swap(a1D[i], a1D[length - 1 - i]);
}

void transpose(int *a2D, int size)
{
      for (int row = 0; row < size; row++)
            for (int col = row + 1; col < size; col++)
                  swap(a2D[row * size + col], a2D[col * size + row]);
}
```

void rotate(int * a2D, int size)

void reverse ~~(int i = 0; i < length~~ int a1D[], int length)

void transpose (int * a2D, int size).

int size = a

int length = b

Array~~[ab]~~ ptr [a b]

ptr(ab)

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Use the backside, if needed

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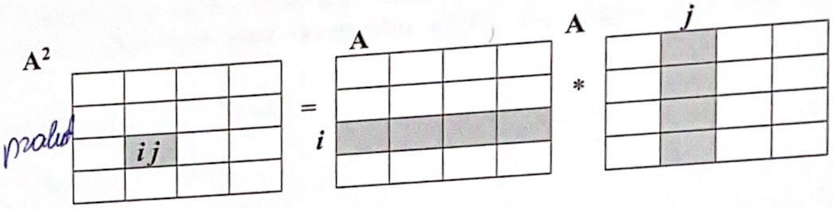
Problem 2

Using functions ***transpose()*** from **Problem 1** and ***scalar()*** from below, write a C++ function ***void square(int *a2D, int *product, int size)*** that takes as its argument a pointer to the first element of a square array ***int *a2D*** of the specified ***int size***, computes its square (multiplies it by itself) and saves it in another square array of the same size, the pointer to the first element of which is given by ***int *product***. Each element p_{ij} in the i^{th} row and j^{th} column of the array ****product*** is the scalar product of the i^{th} row and j^{th} column of the array ****a2D*** and is calculated by the expression: $p_{ij} = \sum_{k=0}^{size-1} a_{ik} a_{kj}$

```
int scalar(int a[], int b[], int length)
{
        int result = 0;
        for (int i = 0; i < length; i++)
              result += a[i] * b[i];
        return result;

}
```



void square (int *a2D, int produd
int size/

Array [a b].
ptr a, b
int product = a∘b
int a= int b
void transpose (int *a2D, int size/
int sealer (int a[], int b[], int length).

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