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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**

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

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. Transposing once more after the rotation will result in vertical flip – the top row will appear at the bottom, the second row will become the last but one, etc. Write a C++ function ***void flip(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 flips it vertically. 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 flip(int *a2D, int size)
{
  transpose(a2D, size);
     for (int i = 0; i < size; i++)
        reverse(a2D[i], size);
   transpose(a2D, size)

}
```

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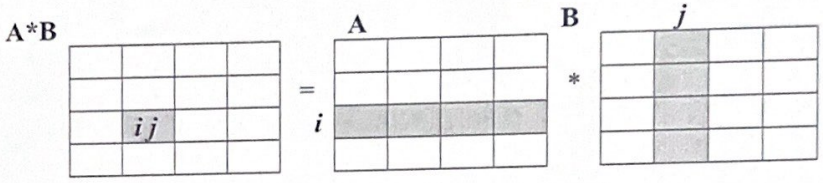
Problem 2

Using functions ***transpose()*** from **Problem 1** and ***scalar()*** from below, write a C++ function ***void mult(int *a2D, int *b2D, int *product, int size)*** that takes as its arguments pointers to the first elements of square arrays ***int *a2D*** and ***int *b2D*** of the same specified ***int size***, computes their product 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 of ***a2D*** and j^{th} column of ***b2D*** and is calculated by the expression: $p_{ij} = \sum_{k=0}^{size-1} a_{ik} b_{kj}$

```
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 mult (int *a2D, int *b2D, int *product, int size)
{
 for (int i=0; i < size; i++);
  {
   for (int j=0; j<size; j++).
   {
    int foo = new int(size);   ← returns pointer
    {                          ← an int
     for (int f=0; f< size; f++).
     foo[f] = a2D[f][j].
     product[i][j] = scaler(a2D[i], foo, size);
   }
```

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See RM

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