CS200 : Introduction to Programming **PreLab/Practice Problem**
Time Allowed:

University ID: **Name:**

1. Complete the given C++ code so that on calling the function $rotate90Clockwise(arr)$ it should rotate the passed 2D dynamic array, clockwise by 90 degrees and print the rotated array on the screen.
   Original Array:

$$arr = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}$$

   Rotated Array:

$$arr = \begin{bmatrix} 13 & 9 & 5 & 1 \\ 14 & 10 & 6 & 2 \\ 15 & 11 & 7 & 3 \\ 16 & 12 & 8 & 4 \end{bmatrix}$$

```
#include <iostream>
using namespace std;
int N=4;
void rotate90Clockwise(int **arr){
```

```
//This will print a rotated array if your implementation is correct
```

```
    cout<<"Rotated Array will be :"<<endl;
    for(int i=0;i<N;i++){
        for(int j=0;j<N;j++){
            cout<<arr[i][j]<<" ";
        }
        cout<<endl;
    }
}
int main(){
    int **arr;
    int count=0;
    arr=new int*[N];
    for(int i=0;i<N;i++)
        arr[i]=new int[N];
    for(int i=0;i<N;i++){
        for(int j=0;j<N;j++){
            arr[i][j]=++count;
        }
    }
    rotate90Clockwise(arr);
    rotate90Clockwise(arr); //now rotating gain
    return 0;
}
```

2. Write the output of the following code:

```
#include <iostream>
using namespace std;
int fun(int n) {
    int x=1;
    static int count=1;
    if(n == 1)
        return --x;
    for (int k=1; k < n; k++) {
        x = x + fun(k) * fun(n-k)+ fun(n-k);
        cout<<x+(++count)<<endl;
    }
    return x;
}
int main() {
    fun(4);
    return 0;
}
```

Output: