CSC 382 **Project 3** **Due 03/10/11**

Average Case

In this project we will try to match the *Average Case* of algorithm A10 as we derived in class and the “*Real Average*” of the algorithm using Monte Carlo approach.

```
A10: void Insertion (int A[ ], int n) // in reality the elements to be sorted are indexed from
                                      // index 1 to index n
{
      int i,j, temp;
      A[0]=-32768; //smallest possible integer using 2 bytes integer representation
      for (i=1; i<=n, i++) {
          j=i;
       (1) while ( A[j] < A[j-1]) { // swap
                  temp=A[j];
                  A[j]=A[j-1];
                  A[j-1]=temp;
                  j--;
          }
      }
}
```

First you must modify A10 to return the number of steps executed. Please note that we consider only basic operations, which are *the “**comparisons” only***. Call this subroutine

Insertion-Mod( ).

1) (Calculated Average)

Let n = 100.

Calculate the Average-case $A(n)$ as we derived in class.

Let *bound* be an integer (choose a large number).

Let *tot-number-steps* = 0 (accumulates total number of

Generate a sequence of n integers (positive and negative as well) using a random number generator where the numbers of the sequence are between 0 and *bound. Call Insertion-Mod ( ) using this sequence and add the number of steps returned by this algorithm to tot-number-steps.*

Repeat steps *e* 100,000 times (i.e., generate 100,000 random sequences and update *tot-number-steps*).

Calculate the real average of algorithm A10 and let this number be $A2(n)$.

Repeat steps *a*)-thru *g*) for the following values of n, n= {100, 500, 1000, 2500, 3000, 3500}.

You final output should look like:

Input size	Calculated Average	Real Average
100	XX	XX
500	XX	XX

..	..	..
3500	XX	XX

Please explain the outcome of the experiments.