CSCI 2380 **Spring 2025** **Mr. Gustavo Dietrich**

Homework 11: Sorting **Due Date:** 4/30/25

In this homework, you'll use any resources available to create the fastest sorting algorithm possible.

The following files have been given to you:

1. A C++ header file (sort.h) declaring the **sort** function.
2. A C++ source file (main.cpp) containing a main() function with tests.

Create new C++ source file named **sort.cpp** that implements the function declared in sort.h so that sort.cpp and the provided files compile into a program that runs with no failed tests and has a lower displayed **total** time.

Submit just the source code of **sort.cpp**. You don't need to submit the main.cpp nor the other files because I will use my own sort.h and main.cpp files to evaluate your sort.cpp file.

Review the examples discussed in class and the textbook to get an idea of what you need to do. Carefully analyze the tests because that will help you understand how the functions that you need to create work.

Do not hesitate to use the corresponding topic in Discussions to post your questions/doubts about this assignment. I will reply as soon as I can.

Algorithm Rules and Hints

- The sorting algorithm in your submission can be based on any combination of sorting algorithms but must contain references (as comments in sort.cpp) to algorithm resources used.
- Using comments explain in general how the algorithm works and your own improvements.
- Feel free to implement helper functions in sort.cpp.

Here are some suggestions:

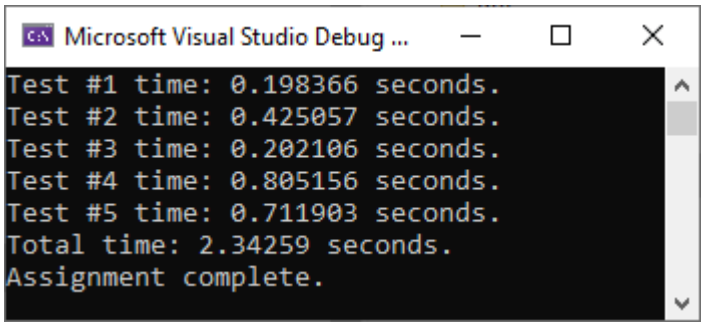
- Focus on algorithms, not line-by-line optimization[1].

[1] 1Famous quote: "Premature optimization is the root of all evil". – Don Knuth.

- Don't sort if you don't have to, i.e. if the array is already sorted.
- The "best" algorithm varies based on input; it may be worth first looking at the input (quickly) and picking an algorithm based on the contents.
- Use online resources to see what algorithms are out there and what inputs they are good for. Many well-known algorithms, e.g. quick sort, have several variations.

IMPORTANT:

Make sure your program compiles and executes in full (it should pass all the tests included in main()). See the picture of a sample run below.



You must submit ONLY ONE solution per team.
Your program must be well commented, use meaningful identifiers, and use indentation to improve its readability.

Your program must have the following comments at the top:

```
//*****************************************************************
// Team #          CSCI 2380          Spring 2025          Homework # 11
// First and Last Name
// First and Last Name
//
//*****************************************************************
```

When done, submit your solution through Blackboard using the "Assignments" tool. Do Not email it.
Paste the link to your final solution along with your source code in the textbox opened when you click on Create Submission before you click on Submit.

The following is the basic criteria to be used to grade your submission:

You start with 100 points and then lose points as you don't do something that is required.

-15 : Your solution does not pass test # 1 in a practical amount of time
-15 : Your solution does not pass test # 2 in a practical amount of time
-15 : Your solution does not pass test # 3 in a practical amount of time
-15 : Your solution does not pass test # 4 in a practical amount of time
-15 : Your solution does not pass test # 5 in a practical amount of time
-50 : Your solution does not beat the benchmark
-20 : Program crashes or loops infinitely when executed
-5 : Unnecessary statements in your code
-100: The code submitted is not your creation (you got it from a web site or another person)
-40 : Program does not compile
-30 : No general explanation of the solution including the improvements
-20 : No reference to algorithm resources used
-20 : Missing/too few comments explaining the code
-10 : Late
-20 : Incorrect/missing source code
-20 : Incorrect/missing link to your solution
-100: No team contribution.
-100: The code submitted is not your creation (you got it from a web site or another person)
-100 : No submission.
-100 : No team contribution

Important: more points may be lost for other reasons not specified here.