Sorting indirectly

You need to be alert to (usually minor) changes that may be made to the assignment statement or to the guidelines after the assignment is first put up. Refresh this frame and re-read the assignment carefully before you make your final submission.

Assignment statement

Consider the problem of determining whether or not a given set of integers $x_1, x_2, ..., x_n$ is unique.

Let $a_1, a_2, ..., a_n$ be a permuation of the given numbers so that those are in ascending order.

Any algorithm ***A*** for determining this must compare a_i to a_{i+1}; otherwise, if the algorithm reports the numbers unique, one such pair could be made identical to get the same (and wrong) answer from the algorithm.

You are allowed to choose any algorithm ***A*** (from any source) to test for element uniqueness. Thereafter, you need to modify the implementation of ***A*** to create a graph G in a stepwise manner so that whenever any two elements x_i and x_j are compared, the edge $x_i \leftarrow x_j$ is introduced if $x_i \leq x_j$, otherwise the edge $x_i \rightarrow x_j$ is introduced (through a function call `addEdge()`.

The resulting graph is directed and acyclic. It should also contain the chain of comparisons for $a_1, a_2, ..., a_n$.

Hence a topological sort of G should yield a sorting of the given elements.

You should do the topological sort by using the post numbering of the graph vertices done by way of a depth first traversal of the graph.

Testing your program

Your program should take the integers as command line arguments and report the results.

Report

In the report (latex / plain text) report the complexity analysis of your scheme and what you can conclude about the time complexity of determining element uniqueness.

Marking guidelines

Assignment marking is to be done only **after** the deadline expires, as submissions gets blocked after the assignment is marked.

Stepwise creation of graph via `addEdge()`	**5**
Depth first traversal of the graph to carryout post numbering of its vertices	**10**
Topological sort of the graph using the post number of its vertices	**5**
Report	**5**
Total Marks	***25***

Assignment submission

Use electronic submission via the WBCM link

You should keep submitting your incomplete assignment from time to time after making some progress, as you can submit any number of times before the deadline expires.

Warning

Cases of copying will be dealt with seriously and severely, with recommendation to the Dean to de-register the student from the course.