Homework #1: Testing the performance of linked lists.

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Testing the performance of linked lists for managing a large number of dates:

Step 1. Implement additional elements as described in the following into your program for Programming #5B:
- Option X (do random ***InsertInOrder*** for **n** times):
  Add one option X into the menu. When the user selects this option, your program should **(i)** call the *Clear* method to empty the linked list of your date database, **(ii)** ask the user to enter a natural number *n*, **(iii)** declare a local *DateType* object *d*, and **(iv)** set up a loop to go through *n* iterations and in each iteration call *d.SetRandomDate( )* to set a random date and then call the ***InsertInOrder*** method of the linked list class to insert the date in *d* into the linked list of your date database.
- Option Y (do random ***Insert*** for **n** times):
  Add one option Y into the menu. When the user selects this option, your program should **(i)** call the *Clear* method to empty the linked list of your date database, **(ii)** ask the user to enter a natural number *n*, **(iii)** declare a local *DateType* object *d*, and **(iv)** set up a loop to go through *n* iterations and in each iteration call *d.SetRandomDate( )* to set a random date and then call the ***Insert*** method of the linked list class to insert the date in *d* into the linked list of your date database.
- Option Z (do random ***Remove*** for **m** times):
  Add one option Z into the menu. When the user selects this option, your program should **(i)** ask the user to enter a natural number *m*, **(ii)** declare a local *DateType* object *d*, and **(iii)** set up a loop to go through *m* iterations and in each iteration first call *d.SetRandomDate( )* to set a random date and then call ***Remove(d)*** to try to remove the date in *d* from the linked list of your date database.
- Test to make sure your implementation of the two additional options is fine.

Step 2. Experiments:

A. **Test and report the time needed for *n* insertions into a sorted linked list**: Try option X several times and use different values of *n* from 1000, 10000, 100000, and up to at least **200,000** or higher. Each time use your watch to roughly estimate the amount of time option X takes (to insert *n* random dates into a **sorted linked list**). **Record and report your findings.**
B. **Right after Experiment A, test and report the time needed for *m* deletions in a sorted linked list of about *n* nodes (where *n* is the value you used for Option X in the very end of Experiment A)**: Try option Z several times now using different values of *m* from 1000, 10000, 100000, and up as you did in Experiment A above. Each time use your watch to roughly estimate the amount of time option Z takes (to remove *n* random dates from a

sorted linked list established by Option X in the very end of Experiment A). **Record and report your findings.**

C. **Test and report the time needed for *n* insertions in an unsorted linked list**: Try option Y several times and use different values of *n* from 1000, 10000, 100000, and up to at least 1,000,000 or higher. Each time use your watch to roughly estimate the amount of time option Y takes (to insert *n* random dates into an **unsorted linked list**). **Record and report your findings.**

D. **Right after Experiment C, Test and report the time needed for *m* deletions in an unsorted linked list of about *n* nodes (where *n* is the value you used for Option Y in the very end of Experiment C)**: Try option Z several times now using different values of *m* from 1000, 10000, 100000, and up as you did in Experiment C above. Each time use your watch to roughly estimate the amount of time option Z takes (to remove *n* random dates from an **unsorted linked list** established by Option Y in the very end of Experiment C). **Record and report your findings.**

Step 3. Reflection and analysis:

A. **About the time needed for *n* insertions into an initially empty sorted linked list**: What do you think is the relationship between the size *n* and the amount of time needed? Why? **Record your thoughts/analysis.**

B. **About the time needed for *m* deletions in a sorted linked list of about *n* nodes**: What do you think is the relationship between the size *n* and the size *m* and the amount of time needed? Why? **Record and report your findings.**

C. **About the time needed for *n* insertions into an initially unsorted linked list**: What do you think is the relationship between the size *n* and the amount of time needed? Why? **Record and report your findings.**

D. **About the time needed for *m* deletions in an unsorted linked list of about *n* nodes**: What do you think is the relationship between the size *n* and the size *m* and the amount of time needed? Why? **Record and report your findings.**

Submit your work

- Record all your experimental findings in Step 2 and your thoughts in Step 3 above in a WORD document. Submit the WORD document under Canvas.
- Compress your entire Program folder into a zip file and upload it through Biola Canvas.
- Carefully fill out this self-evaluation report and upload it through Biola Canvas. Note that you will receive no point for missing the self-evaluation report or missing the integrity review in the report.