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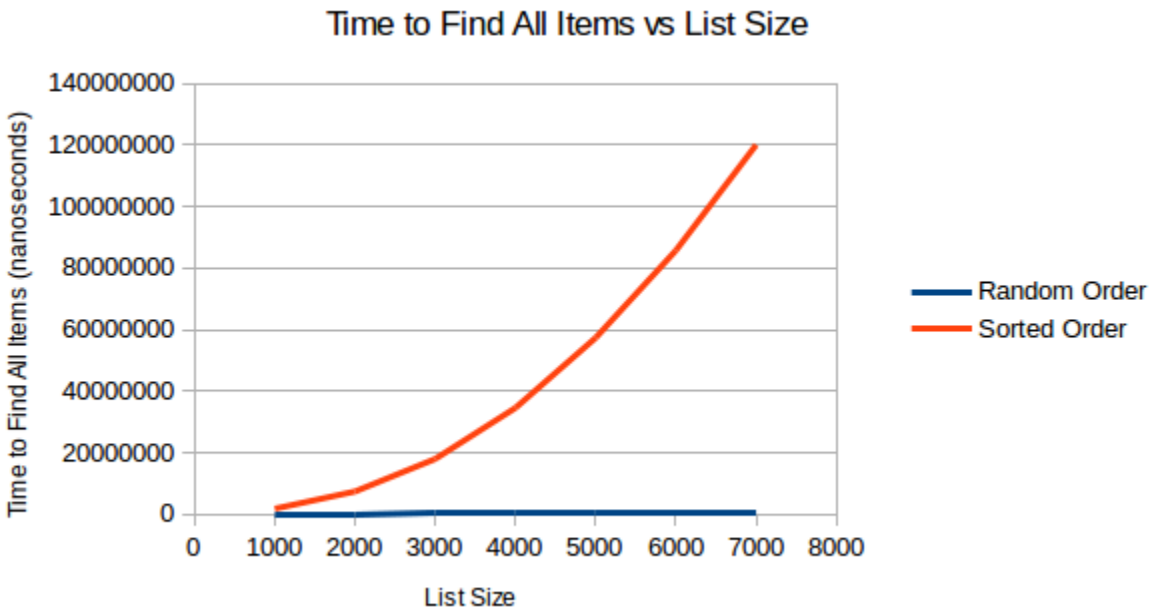
1. Who is your programming partner? Which of you submitted the source code of your program?
My partner on this assignment was Ashley Grevelink, I submitted the code for the program.

2. Evaluate your programming partner. Do you plan to work with this person again?
My partner did a very good job. I would work with her again.

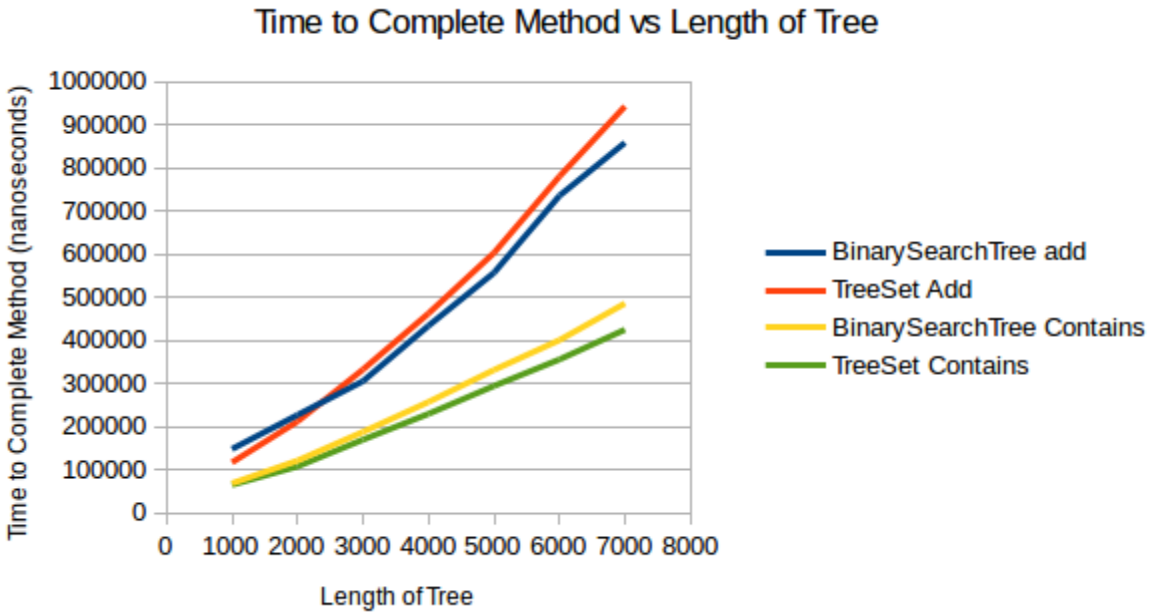
3. Design and conduct an experiment to illustrate the effect of building an N-item BST by inserting the N items in sorted order versus inserting the N items in a random order. Carefully describe your experiment, so that anyone reading this document could replicate your results. Submit any code required to conduct your experiment with the rest of your program and make sure that the code is well-commented. Plot the results of your experiment. Since the organization of your plot(s) is not specified here, the labels and titles of your plots(s), as well as, your interpretation of the plots is critical.



I added the items to a BST in sorted order, then I recorded the average time it took to run the contains method on each item in the tree. I did the same with adding items in a random order to a BST, and graphed the results.

It takes longer to run the contains method when you add items in sorted order, and the time difference only grows as the length of the tree gets longer. The contains method for each item when you add in a sorted order has a complexity of O(N), while the complexity when added in random order is closer to O(log N) for each item.

4. Design and conduct an experiment to illustrate the differing performance in a BST with a balance requirement and a BST that is allowed to be unbalanced. Use Java's TreeSet as an example of the former and your BinarySearchTree as an example of the latter. Java's TreeSet is an implementation of a BST which automatically re-balances itself when necessary. Your BinarySearchTree class is not required to do this. Carefully describe your experiment, so that anyone reading this document could replicate your results. Submit any code required to conduct your experiment with the rest of your program and make sure that the code is well-commented. Plot the results of your experiment. Since the organization of your plot(s) is not specified here, the labels and titles of your plots(s), as well as, your interpretation of the plots is critical.



I timed how long it took to add randomly order items into a TreeSet, multiple times, and averaged the result. I then timed how long it took to run the contains method on each item in the tree, multiple times, and averaged the results of that experiment as well. I repeated these experiments with a BinarySearchTree instead of the TreeSet and recording those results into the graph.

It takes longer to add items into the list if the list must be balanced than it takes to add them when the list can be unbalanced, up until a certain point. After that point, it is quicker to add them and balance as it goes, because it is able to find the spot to add them into easier. It is also quicker to run the contains method than it is for a tree that is unbalanced.

5. Many dictionaries are in alphabetical order. What problem will it create for a dictionary BST if it is constructed by inserting words in alphabetical order? Explain what you could do to fix the problem.

The “tree” would be more like a linked list if they are added in alphabetical order, with each parent only having one child, massively slowing down the time it takes to run methods, making the complexity of the add and contains methods O(N) instead of the O(log N) that it should be.

6. How many hours did you spend on this assignment?

It took me about 10 hours to work on this assignment.