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hw.docx

2. The single argument call to insert causes an error because the function utilizes the ‘>’ operator to determine where to insert the data. Because the Complex class has no overloaded ‘>’ operator, the single parameter insert function of the Sequence class does not know how to compare the values of two Complex objects, causing it to error.

3b. We could not implement the function recursively using the single parameter listAll because we would need path to carry forward across each recursive call to the function. Without the second parameter, we lose the all the data stored within the string “path” which we need to build upon to get the correct output. If the function were to return a string, we may be able to build upon path by returning path + /whatever/; however, because there are several submenus, the string that we build would not contain the desirable output.

4a. While the if statements are O(1) for each comparison they make, each for loop indexes N times whenever the function is called. Each for loop is nested, therefore exponentially increasing the number of steps. Because there are 3 nested for loops, the big O notation for this function would be O(N3). The if statement comparisons are marginal compared to the N steps occupied by the for loop.

4b. The difference reduces the number of iterations by half. Because the change affects two for loops, the overall effect on the function is O(.25N3). In small cases, this reduces the computation time, but because .25 is a constant, the overall complexity of this algorithm remains O(N3).

5a. Both loops add a complexity of the amount N. The get function adds a complexity of N/K which is a fraction of N. For each loop you get N\*N/K or N2/K and because there are two loops, you get 2(N2/K). For an overall complexity of O(N2).

5b. Both loops add a complexity of N. All of the operations within the for loop adds a complexity of 1. So for both we get N+N or 2N, for a O(2N) 🡪 O(N). This is implementation is more efficient, because it decreases the total complexity of the function by ¼.