Homework 4

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1e.

Pushing back 5 elements to the vector when k = 2 results in the vector being copied to another address and having its size increased. This meant the iterator no longer points to the elements of the vector, resulting in an error.

3.

The Set class doesn’t provide a way to compare two Coord objects. Since Coord isn’t a built in type like int or string, the compiler doesn’t know how to compare Coord objects in Set’s insert() and findFirstAtLeast() since the class doesn’t define/implement its own comparison operators.

4b

If there was only one parameter, then either the file pointer or the string would be the only parameter. If the file pointer was the parameter, there would have been no way to print out all the paths since there isn’t a string to keep track of the current path. If the string was the parameter, there would be no way to pass in a file from a directory’s file vector. Therefore, it is impossible to use recursion to print out all the file paths.

5a

O(N^3)

3 nested for loops that each loop through N times.

5b

O(N^3)

Even though the middle loop runs j < i times, in the worst-case scenario, the middle loop runs N times, meaning the time complexity is still N^3.

6a

O(N^2)

The for loop runs N times. Get() runs N times by doing a linear search. Insert(), which runs in constant time, calls findFirstAtLeast(), which runs N times. Insert() also calls insertBefore(), which inserts a node in constant time. Therefore, unite() has a time complexity of O(N^2).

6b

O(NlogN)

The first two for loops push\_back() into a vector N times, which is O(N). Sort() has a time complexity of O(NlogN). The while loop runs N times, and the doErase() inside the loop deletes nodes in constant time. The for loop runs 2 \* N times, and the insertBefore() inside the loop inserts nodes in constant time.

O(NlogN) > O(N) , so O(logN) is the time complexity

6c

O(N)

The while loop runs N times since both sets have length N. The insertBefore() in the while loop inserts a node in constant time. The for loop runs through the remaining nodes in set2. The time complexity is therefore O(N).