COS285 Data Structures
Alex Bard & Devin Chamberlain
Assignment 8

Link to GitHub Repository:
https://github.com/AlexBard122/Assignment8

Task 1:
Complexity order is O((log n)(log n)) or O((log n)^2) because we are creating a treemap which is O(log n) within another treemap which results in (log n)*(log n) to get O((log n)(log n)).

Task 2:
Complexity order is O(N) because it traverses the entire map of reports in a given state.

We originally attempted to use a combination of TreeMap with RedBlack tree but found it to be slower to build and search, likely due to added complexity and time introduced by recursive calls and rotations. Our final implementation was a corrected version of our TreeMap of TreeMaps from Assignment 6 in which we fixed the count method so it provided the correct number of reports.

Justification of data structure choice:

Insertion for our chosen implementation was faster than previous implementations as shown in the chart below but search complexity was greater. The difference in actual runtime was nominal though.

Implementation	Insertion Complexity	Search Complexity
Binary Tree	O(N^2)	O(LogN)
TreeMap + AVL Tree	O(N LogN)	O(LogN)
TreeMap + TreeMap	O((LogN)^2)	O(N)

Inputs and outputs:

A. “accidents.csv” “IL” “2022-09-08”
11753 Miliseconds to build the treemap
6773 Reports are available for IL on and after the date 2022-09-08
1.792 Miliseconds to calculate the number of reports

B. “accidents.csv” “CA” “2022-09-08”

12436 Miliseconds to build the treemap
105463 Reports are available for CA on and after the date 2022-09-08
1.436 Miliseconds to calculate the number of reports

C. “accidents.csv” “TX” “2022-01-08”

13185 Miliseconds to build the treemap
93029 Reports are available for TX on and after the date 2022-01-08
4.795 Miliseconds to calculate the number of reports

D. “accidents.csv” “FL” “2022-11-11”

12558 Miliseconds to build the treemap
28935 Reports are available for FL on and after the date 2022-11-11
1.744 Miliseconds to calculate the number of reports

E. “accidents.csv” “FL” “2022-07-15”

12292 Miliseconds to build the treemap
83801 Reports are available for FL on and after the date 2022-07-15
1.219 Miliseconds to calculate the number of reports