

5. initializeCandidates(List<String> candidates)

- Time Complexity: $O(n)$ where n is the number of candidates that is added into the priority queue
- Space Complexity: $O(n)$ where n is the number of candidates because every candidate is stored in both the map and heap.

setTotalVotes(int p)

- Time: $O(1)$ assigned a value to a variable.
- Space: $O(1)$ setting an integer.

castVote(String candidate)

- Time: $O(\log n)$ where n is number of candidates. Updating in the map is fast ($O(1)$), but adding to the heap takes $\log n$ time because it needs to reorder
- Space: $O(1)$ per vote

castRandomVote()

- Time: $O(n)$ where n is number of candidates. Converting the map keys into a list takes $O(n)$ time. After that, casting the vote is $O(\log n)$
- Space: $O(n)$ where n is number of candidates is added to a temporary list

rigElection(String candidate)

- Time: $O(n \log n)$ where n is number of candidates. First, it loops through all candidates to reset their votes ($O(n)$). Then we insert every candidate into the heap again (each insert is $\log n$), so together it's $O(n \log n)$.
- Space: $O(n)$ where n is number of candidates in the sorted and result lists

getTopKCandidates(int k)

- Time: $O(n \log n)$ where n is number of candidates because it sorts the entire list of candidates by votes and name to find the top k . Sorting n items is $O(n \log n)$.
- Space: $O(n)$ where n is the number of candidates because the sort operation and result list hold n elements.

auditElection()

- Time: $O(n \log n)$ where n is number of candidates where we sort all the candidates to print them in order.
- Space: $O(n)$ Sorting creates a new list temporarily, so space usage grows with the number of candidates