

# Assignment 8

C-4.11. Suppose we are given an  $n$ -element sequence  $S$  such that each element in  $S$  represents a different vote in an election, where each vote is given as an integer representing the ID of the chosen candidate. Suppose we know who the candidates are and the number of candidates running is  $k < n$ . Describe an  $O(n \log k)$ -time algorithm for determining who wins the election.

```
Algorithm FindWinner( $S, n$ ):  
     $D \leftarrow$  empty Dictionary(HashTable)  
  
    for  $i \leftarrow 0$  to  $n - 1$  do  
         $id \leftarrow S.atRank(i).element()$   
        if  $D.findElement(id) \neq \text{null}$  then  
             $count \leftarrow D.findElement(id)$   
             $D.replaceElement(id, count + 1)$   
        else  
             $D.insertElement(id, 1)$   
  
     $maxVotes \leftarrow 0$   
     $winner \leftarrow \text{null}$   
  
    for each  $id$  in  $D.keys()$  do  
         $count \leftarrow D.findElement(id)$   
        if  $count > maxVotes$  then  
             $maxVotes \leftarrow count$   
             $winner \leftarrow id$   
  
    return  $winner$ 
```

C-4-22 Let A and B be two sequences of n integers each. Given an integer x, describe an  $O(n \log n)$ -time pseudo code algorithm for determining if there is an integer a in A and an integer b in B such that  $x = a + b$ .

```
Algorithm ExistsSum(A, B, x)
    Sort(B)

    for i ← 0 to A.size() - 1 do
        a ← A.elementAtRank(i).element()
        target ← x - a
        if BinarySearch(B, target) ≠ NOT_FOUND then
            return True

    return False
```