Assignment 12

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 pseudo code algorithm for determining who wins the election.

1. Calculate the height of a Binary Tree. Implement your solution in the JavaScript file RBTree-HW.js that is provided. You are to do this both as a recursive function that traverses the tree and secondly using the Euler Tour template class (two different functions).
2. Calculate the black height of a Red-Black Tree. Implement your solution in the JavaScript file RBTree-HW.js that is provided. You are to do this both as a recursive function that traverses the tree and secondly using the Euler Tour template class (again two different functions). There are two methods on a Red-Black tree to determine the color of a node, i.e., T.isRed(p) and T.isBlack(p).
3. **C-4.11** would have to be done using a BST based Dictionary. Implement your algorithm using the BST_Dictionary class. Your code goes in the BST_Dictionary-HW12.js file. In that file, I have also provided a function genDat(n, k) that generates random data into a DLinkedList object so you can test your function many times with different winners and even sometimes a tie will have to be handled. I have also provided a genDat2(n, k) that generates data into an array. Implement another function that traverses an array of voting data. So this questions is asking for two different functions, one that traverses a linked list and the other an array.
4. Suppose we are given an *n*-element list S such that each element in S represents a different vote in an election, and where each vote is given as an integer representing the ID of the chosen candidate. Describe an O(n) pseudo code algorithm for determining who wins the election (turn in a pseudo-code version as well). This clearly needs to use a hash table based Dictionary, i.e., the HT_Dictionary class. Your code goes in the file HT_Dictionary-HW12.js. The functions that you are to implement are findWinners(dat) and findWinners2(dat) that take the data generated by genDat or genDat2 and determines which candidate wins the election (again there are two functions to define one for a linked list and the other for an array).