Assignment 4

Practice Assignment

1. Suppose you have an array $S$ of size $n$, where each element in $S$ represents a different vote for class president, where each vote is given as an integer representing the student ID of the candidate. Without making any assumptions about who is running or how many candidates there are, design an $O(n \log n)$ algorithm to determine which candidate receives the most votes. [10 points]

2. Given the input of the first problem, give an $O(n)$ time algorithm to determine if some candidate received a majority ($\lceil \frac{n+1}{2} \rceil$) of the votes.
   - $O(n)$ average or expected time is OK
   - so the hint is to look for the median
   [10 points]

3. (a) Given a list of $n$ integers, describe how to find the $\sqrt{n}$ smallest items, listed in increasing order, in $O(n)$ time. The input list is unsorted, but the output should be sorted. (Hint: $\sqrt{n} \log \sqrt{n}$ and $\sqrt{n} \log n$ are both $O(n)$.)
   (b) Exercise 9.1 (Largest $i$ numbers in sorted order) – Comparing running time of different methods.
   10 points

Total: 30 points