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October 10th, 2018

CMPT 435L - 111

Minmax

Date Assigned: 10/05/2018

Due: Midnight 10/12/2018 on iLearn

Please read turn-in checklist at the end of this document before you start doing exercises.

Section 1: Pen-and-paper Exercises

1. We are given an array of n numbers A in an arbitrary order. Design an algorithm to find the largest and second largest number in A using at most 3/2n -2 comparisons.
   (i) **describe the idea behind your algorithm in English (5 points);**

   My algorithm will hold two key variables, a 'first'(largest) and 'second'(second-largest) value. Throughout a loop which will run through the entire array, the first variable will be compared to an array element, if it is less Than the element, it will hold the elements value from then, until a new larger value is found. At the same time, the second value is changed to that of the value previously held by the first. If the value being compared is in between the first and second value, the second value is updated to hold it.

   (ii) provide pseudocode (10 points);

   ```
   Input A[]

   First, second

   For I in [0, sizeOf(A) - 1]
       if A[i] > first
               second = first
               first = A[i]
       end if
       if A[i] > second & != first
               second = A[i]
       end if
   End for
   ```

   (iii) analyze the number of comparisons used in your algorithm (5 points).

   Let n = the size of the array A. For all of n, which we do not know, the largest and second largest number can be found using 2n - 2 comparisons. Since the variable may not always result in some comparison being made, we know from

my pseudocode that at most, 3 values can result in comparisons being made, giving us a maximum of 3/2n - 2 comparisons.

Full credit (20 points) will be awarded for an algorithm that uses at most 3/2n -2 comparisons. Algorithms that make more comparisons will be scored out of 5 points.

TURN-IN CHECKLIST:

1. **Answers to Section 1 (.doc/.txt).**
   Remember to include your name, the date, and the course number in comments near the beginning of your code/report.

2. **Create a folder and name it 'FirstName_LastName_assignment_6'. In the newly created folder copy and paste your files (.doc/.txt/.java files). Then compress the folder, and submit to iLearn.**