Software Analysis and Design 1. CSCI-135. Spring 2015. Vector algorithms competition.

Round One

Problem 1 (3 points)
Given a vector of integers v, compute whether or not the elements in the vector are:
(a) in non-decreasing order, (b) in non-increasing order.

Problem 2 (3 points)
Find whether or not a given vector of characters v is a palindrome.

Problem 3 (3 points)
Find the difference between the maximum and the minimum values in a vector of integers v.

Problem 4 (3 points)
Determine whether or not two vectors of integers v1 and v2 are exactly equal to each other (that is, their corresponding elements are exactly the same).

Problem 5 (3 points)
Given a vector of integers v, find the length of the longest contiguous subsequence of positive numbers in this vector.

Problem 6 (3 points)
In a given vector of integers v, find two adjacent elements such that one divides another. Report an error if such a pair does not exist.

Problem 7 (3 points)
A local maximum in a sequence of numbers is a number that is greater or equal than its immediate neighbors. Print all local maxima found in the vector of integers v.

Round Two

Problem 1 (5 points)
Given two **already sorted** vectors of integers v1 and v2, make another vector that contains all elements of v1 and v2 in the sorted order.

Problem 2 (5 points)
Given a vector of integers v of length $N = $ v.size(), compute

(a) the sample mean of these values $Avg = \dfrac{1}{N} \sum_i$ v[i], and

(b) their varaince $Var = \dfrac{1}{N-1} \sum_i ($v[i]$ - Avg)^2.$

Problem 3 (5 points)
Find the median value in the given vector of integers v.

Problem 4 (5 points)
Given two vectors of integers v1 and v2, determine whether or not every element of v1 is also an element of v2, and the other way around.

Problem 5 (5 points)
Find four largest elements in the given vector of integers v. (You may assume that all elements in the vector are distinct and don't repeat).

Problem 6 (5 points)
In a vector of integers v, find a coniguous subsequence of length k whose sum is the largest and print it out (if such a subsequence exists).

Problem 7 (5 points)
Given two vectors of integers with positive elements, determine whether or not one vector is a permutation of the other. (You may destroy/change the vectors in the process).