

# EECE 230 Introduction to Programming, Sections 4, 5, and 6

## Quiz I

Oct 22, 2013

- The duration of this exam is 1 hour and 50 minutes.
- It consists of 3 problems.
- The exam is open book. You can use also all the material on Moodle: lecture notes, programming assignments, and solutions, etc. You are **NOT** allowed to use the **web (imail included)**, You are not allowed to use **USB's** or files previously stored in your **account**.
- If you violate the above rules or if you communicate with a person other than the exam proctors during the exam, you will immediately get zero and you will be referred to the appropriate disciplinary committee.
- Active cell phones and any other unauthorized electronic devices are absolutely not allowed in the exam rooms. They should be turned off and put away.
- Plan your time wisely. Do not spend too much time on any one problem. Read through all of them first and attack them in the order that allows you to make the most progress.
- Submit your solutions each part in a separate file as indicated in the booklet. Include your name and ID number in each file. Submit the files online in a single zip file called *yourLastName.yourFirstName.zip*.
- Good luck!

**Problem 1 (50 points). Number of positive Integers**

- a) **(25 points)** Write a program which prompts the user to enter three integers, and finds the number of positive integers in the user input.

*Examples:*

```
Please enter three integers: 3 -4 5
Number of positive integers: 2
```

```
Please enter three integers: 0 -4 5
Number of positive integers: 1
```

```
Please enter three integers: 0 -4 -1
Number of positive integers: 0
```

```
Please enter three integers: 2 4 2
Number of positive integers: 3
```

In this part, the use of loops or arrays is forbidden.

Submit your solution in a file called Prob1a.cpp including your name and ID number.

- b) **(25 points)** Write a program which prompts the user to enter a positive integer  $n$  followed by a list of  $n$  integers. Your program is supposed to find the number of positive integers in the input list. Your program is supposed to display an error message if  $n$  is negative.

*Examples:*

```
Please enter the number of integers: 9
Please enter 9 integers: 3 -4 -3 5 2 0 2 0 -1
Number of positive integers:4
```

```
Please enter the number of integers: 0
Number of positive integers: 0
```

```
Please enter the number of integers: -2
Number of integers negative!
```

Submit your solution in a file called Prob1b.cpp including your name and ID number.

**Problem 2 (30 points). Three contiguous integers whose sum is zero**

Write a program which prompts the user to enter a list of integers whose end is the indicated by the sentinel -999. Your program is supposed to check whether or not the the list contains three contiguous integers whose sum is equal to zero.

*Examples:*

- Each of the following lists contain three contiguous integers whose sum is zero (underlined)

```
30 10 - 21 11 7 - 999
```

```
30 0 10 - 10 7 - 999
```

30 0 10 - 10 7 -4 2 2 - 999

- None of the lists below contain three contiguous integers whose sum is zero.

30 10 12 7 - 999

10 - 999

0 - 999

-999

Your program is supposed to give a YES/NO answer only.

Any correct solution of this problem is worth 25/30 points. To get full grade you are supposed to solve it without using arrays.

Submit your solution in a file called Prob2.cpp including your name and ID number.

**Problem 3 (30 points). Longest increasing subsequence**

Write a program which prompts the user to enter a list of integers whose end is the indicated by the sentinel -999. Your program is supposed to find the **length of the longest increasing subsequence** (of contiguous elements) of the input list.

For example, consider the sequence

10 2 5 33 -5 -999

The following table shows all its subsequences (of contiguous elements) underlined and whether or not they are in increasing order.

subsequence	increasing order?	subsequence	increasing order?
<u>10</u> 2 5 33 -5	<b>YES</b>	10 <u>2</u> 5 33 -5	NO
10 <u>2</u> 5 33 -5	NO	10 2 <u>5</u> 33 -5	<b>YES</b>
10 2 <u>5</u> 33 -5	NO	10 2 5 <u>33</u> -5	<b>YES</b>
<u>10 2 5 33</u> -5	NO	10 2 5 <u>33</u> -5	NO
10 <u>2 5 33</u> -5	NO	10 2 5 <u>33</u> -5	<b>YES</b>
10 2 <u>5 33</u> -5	<b>YES</b>	10 2 5 <u>33</u> -5	NO
10 <u>2 5 33</u> -5	<b>YES</b>	10 2 5 33 <u>-5</u>	<b>YES</b>
10 <u>2 5 33</u> -5	<b>YES</b>		

Thus the length of the longest increasing subsequence is 3 (first column, last row).

Below are other examples of integer sequences and their corresponding longest increasing subsequences (underlined).

- 3 2 3 5 5 4 6 20 19 - 999  
Length of the longest increasing subsequence: 3.
- 2 3 5 10 11 - 999  
Length of the longest increasing subsequence: 5.
- 10 5 3 2 - 999  
Length of the longest increasing subsequence: 1.
- -999  
Length of the longest increasing subsequence: 0.

You are only asked to find the length of the longest increasing subsequence. That is, your program is NOT supposed to display a increasing subsequence whose length is maximal (i.e., the above underlined subsequences).

Submit your solution in a file called Prob3.cpp including your name and ID number.

Any correct solution of this problem is worth 20/30 points. Faster solutions are worth more points.