CMSC 131 Spring 2005 Quiz 3 Worksheet

The third Quiz of the course will be on Wednesday, Feb 16 during your lab (discussion) session. The following list provides more information about the quiz:

- You will have 25 minutes to complete the quiz.
- It will be a written quiz (not using any computer).
- It will be closed-book, closed-notes, and no calculator is allowed.
- Answers must be neat and legible. We recommend that you use pencil and eraser.
- The quiz will be based on the exercises you will find below. The quiz will ask you to write pseudocode for a particular problem.
- We have provided last semester’s quiz solution at the end. Take a look at it so you get an idea of the pseudocode we expect.

The following exercises include the material to be covered in Quiz #3. Solutions to these exercises will not be provided, but you are welcome to discuss your solutions with TAs and instructors during office hours. Keep in mind that in the following exercises you are being asked to provide only pseudocode.

1. Write pseudocode for a program that computes the number of digits in an integer. For example, for the integer 1776 the program will return 4.

2. Write pseudocode for a program that computes the average of a set of values after the highest and lowest scores have been removed.

3. Write pseudocode for a program that reads a sequence of integer values and determines whether it is a decreasing sequence. A decreasing sequence is one where each value is greater than or equal to the next element in the sequence. The program will first read the number of values to process followed by the values in the sequence. The program will print the message "Decreasing" for a decreasing sequence and "Non-Decreasing" otherwise. For example, here are two decreasing sequences:

   90  87  30  0  -1  -2
   110  4  0  -20

The following are non-decreasing sequences:

   90  100  20  4
   30  24  -2  -1  8  9
4. Write pseudocode for a program that displays a multiplication table for a range starting at 1 up to a designated upper limit. For example, for a limit of 4 the table will look like the following:

```
  1  2  3  4
 1  1  2  3  4
 2  2  4  6  8
 3  3  6  9 12
 4  4  8 12 16
```

5. Write pseudocode for a program that prints a histogram for a set of five values. For example, for the set of values 2 5 1 3 1 the program will generate the following histogram:

```
*  
*  
*  *
* * *
* * * *
* * * * *
```

6. Write pseudocode for a program that prints a line of text centered in a particular field width. The program takes as input a string and the size of the field where the text will be displayed. The program will generate a new string with the original string centered on the specified field width.

7. Write pseudocode for a program that computes the atomic weight of a compound based on the compound formula. For simplicity assume only the following three elements can be part of any compound:

<table>
<thead>
<tr>
<th>Element</th>
<th>Atomic Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca</td>
<td>20</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
</tr>
<tr>
<td>N</td>
<td>7</td>
</tr>
</tbody>
</table>

For example, the weight of the component 2Ca3N will be 40 + 21 \(\rightarrow\) 61. Examples of other possible components are: Ca3N4H3N, 2H, CaHN.
8. [Note: This problem was last semester’s quiz. A solution is provided at the end.] Write pseudocode for a program that reads a sequence of unique integer values and determines whether it is an increasing sequence. An increasing sequence is one where each value is greater than the preceding one. The sequence will be terminated by the special value -999, which is not considered to be part of the sequence. The program will print the message "Increasing" for an increasing sequence and "Non-Increasing" otherwise. For example, here are two increasing sequences:

\[
\begin{array}{cccccc}
2 & 45 & 90 & 134 & -999 \\
-2 & -1 & 0 & 5 & 6 & -999
\end{array}
\]

The following represent two non-increasing sequences:

\[
\begin{array}{cccccc}
10 & 20 & 15 & 30 & -999 \\
11 & 100 & 2 & 90 & -999
\end{array}
\]

You may assume that the integer sequence will have at least two integer values and no two values will be equal.

To keep things simple, you can read in the next integer and store it in some variable x as follows:

\[
x = \text{read()}
\]

You can print a value x or message as follows:

\[
\text{print(x)} \quad \text{or} \quad \text{print(“Hello”)}
\]

You do not need to implement any Java code for this problem, just the pseudocode. Remember, pseudocode should be detailed enough that it can be converted by a competent programmer into Java, but should not contain Java-specific details.

**Problem 8 One possible solution**

```java
increasing = true
prev = read()

do {
    curr = read()
    if ( curr != -999 ) {
        if ( curr <= prev ) then
            increasing = false
        else
            prev = curr
    } while (increasing and curr != 999 )

if ( increasing ) then
    print(“Increasing”)
else
    print(“Non-Increasing”)
```