

CS 135

Exercise #8

Point value: 40

Date due: email source file (using mail utility) to your lab instructor by 11:59pm Fri, Oct 13

New Skills Practiced (Learning Goals)

- Problem solving and debugging.
- Use of repetition structures (while statement)
- End-of-file controlled looping
- Sentinel-controlled looping
- Nested looping

The following problem is a variation of Programming Exercises 13 and 14 from Chapter 5 of the textbook.

If the first number in a sequence is a positive integer, x

Let $a_0 = x$,

a_n is defined as follows

if a_n is even, then $a_{n+1} = a_n/2$

if a_n is odd, then $a_{n+1} = 3 * a_n + 1$

Then there exists an integer k , such that $a_k = 1$

For example, if $x = 75$, then $k = 14$ and the numbers in the sequence are: 75, 226, 113, 340, 170, 85, 256, 128, 64, 32, 16, 8, 4, 2, 1. The largest number in the sequence is 340 and it is at position 4 in the sequence (assuming 75 is at position 1).

Design and implement a complete C++ program that will

- display your name, lecture and lab section #s, and exercise #
- read a series of integers (greater than 0) from a file (via Linux redirection) and for each integer display (to the screen)
 - the integer
 - the number of steps it takes to reach 1
 - the largest value in the sequence and its position

When the program compiles and runs correctly on bobby.cs.unlv.edu, use the mail utility to email a copy of the program file to your lab instructor. Make sure the subject line of your email includes your name, lecture and lab section #s, and the exercise # if you wish to receive full credit.

NOTES:

- Assume that all input values in the data file will be integers greater than 0.
- When constructing data files, separate each integer with whitespace. Each line in the data file should be terminated with a newline.
- It is a good idea to send a carbon copy to yourself (-c option) of all emails sent to your lab or course instructor when using the mail utility.
- A comment with your name, lecture section#, lab section#, and exercise# should be at the start of your program file.

Sample terminal session:

```
[lee@bobby keys]$ more data4eight
75 678
```

13 4

```
[lee@bobby keys]$ g++ ex08.cpp
```

```
[lee@bobby keys]$ ./a.out < data4eight
```

Lee Misch Lec# 10__ Lab# 10__ Exercise #8

Starting at 75 it takes 14 steps to reach 1

The largest number in the series is 340 at position 4

Starting at 678 it takes 51 steps to reach 1

The largest number in the series is 4372 at position 19

Starting at 13 it takes 9 steps to reach 1

The largest number in the series is 40 at position 2

Starting at 4 it takes 2 steps to reach 1

The largest number in the series is 4 at position 1

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