

# CSCI-2300

## Lab 3

February 7, 2007

This lab is about designing an efficient program. Get help from the TAs if you are stuck. Present your completed work to a TA to get your full credit for the lab.

This is a problem from your textbook: 3.6

The *Josephus problem* is the following game:  $N$  people, numbered 1 to  $N$ , are sitting in a circle. Starting at person 1, a hot potato is passed. After  $M$  passes, the person holding the hot potato is eliminated, the circle closes ranks, and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus, if  $M = 0$  and  $N = 5$ , players are eliminated in order, and player 5 wins. If  $M = 1$  and  $N = 5$ , the order of elimination is 2, 4, 1, 5.

- a) Write a program so solve the Josephus problem for general values of  $M$  and  $N$ . Try to make your program as efficient as possible. Make sure you dispose of cells.
  - First design your program on paper in pseudo-code and discuss with the TA how you made your program as efficient as possible. Be prepared to answer parts b and c during this discussion. Only after you meet with the TA should you code the final solution.
- b) What is the running time of your program?
- c) If  $M = 1$ , what is the running time of your program? How is the actual speed affected by the `delete` routine for large values of  $N$  ( $N > 100,000$ )?