COMP 208: Computers in Engineering

Winter, 2012

Assignment 3: The Josephus Problem

Due Date

Assignment 3 is due on Wednesday, February 29 at midnight. The cutoff is automated and is exactly at this time. Assignments submitted within the next hour will be considered late. After that time they will not be accepted at all.

The assignment is to be done individually. You can collaborate on understanding the problem but you must write the solutions independently. Submissions might be subject to being checked by plagiarism detection software.

Introduction

The problem we are going to examine is named after Flavius Josephus, a Jewish historian who lived in the first century and reputedly survived the war with the Romans by using his mathematical talents. He described being trapped in a cave together with 40 comrades. His companions in the group of 41 decided that death was preferable to capture by the Romans. They formed a circle went around the circle repeatedly, each time killing every third person until only one was left. That person was supposed to commit suicide. Josephus wasn't happy with this plan so he calculated where he had to stand to survive. When he was the last person left alive he surrendered to the Romans and lived to chronicle that period of history. (You can check Wikipedia for more information about this problem and its history).

Mathematicians have formulated a problem known as the Josephus Problem based on this incident. The problem can be formulated as follows:

Given a group of n men arranged in a circle with an edict that every m^{th} man will be executed going around the circle until only one man remains, find the position in which you should stand in order to be the last survivor.

Assignment

You are to write a Fortran program to solve this problem

Your program should input two numbers, n, the number of men in the circle and m, the number that we count before executing the next man. The program must use an array to represent the men in the circle.

Write a loop to run your program several times (at least 5) with different inputs for n and m.

The program should write a "history" of the problem for each test value of n and m to a file. You should first output the value for n and m. Each subsequent line of the file should consist of a list of the survivors in the circle after a person has been executed. Repeat this for the next value of n and m.

Use the Fortran statements OPEN and CLOSE to open and close the output file and WRITE the output to the file you have opened.

Requirements

- The program must be written in Fortran
- You must use an array to represent the men in the circle.
- You must write the output directly to a file from within the program
- Use meaningful variable names
- Comment and indent your code. It is your responsibility to make it readable to the grader
- Test your program with at least 5 different pairs of values for n and m
- Submit **the source file** A3_123456789.f90 where 1234567898 is replaced by your student ID number.
- Also submit the result of your running the program in the file RESULT_123456789.txt that your program generates. Make sure the output file specifies the different values of n and m being used.