CS 118 — Programming Fundamentals
Assignment #8

Due Date: Sunday, December 1st at 11:55pm on Google Classroom.

Instructions: Assignments are to be done individually. **No late assignments will be accepted.** You must complete this assignment by yourself. You cannot work with anyone else in the class or with someone outside of the class. The code your write must be your own. You are encouraged to get help from the instructional staff. You may post general questions on Piazza. Do not post more than one line of code when using Piazza.

You must **submit a single zip file** containing your code and documentation on Google Classroom named ⟨*your_student_id*⟩*.zip* where ⟨*your_student_id*⟩ is something like *i19-XXXX*. This means that you must submit only **one file named *i19-XXXX.zip* containing only your source files**. Each file that you submit **must contain your name, student-id, and assignment#** on top of the file in comments. You submission must NOT contain multiple main() functions, otherwise it will not compile for grading. Test your program on a lab machine before submission.

Follow the instructions. Assignments not following the instructions will be awarded zero points.

Assignment Statement: Write a program that generates a *random walk* across a $n \times m$ array where n and m are given as command line arguments. The array will contain characters (all `'.'` initially). The program must randomly *walk* from element to element, always going up, down, left, or right by one element (NOT diagonally). The elements visited by the program will be labeled with the letters `A` through `Z`, in the order visited. Here's an example of the desired output for the command `./randwalk 12 15`:

```
. . . . . . . X Y . . . . . .
. . . . . . . W Z . . . . . .
. . . . . . . V U . . . . . .
. . . . . . R S T . . . . . .
. . . . . . Q . . . . . . . .
. . . . . . P O N . . . . . .
. . . . . . . . M . . B A . .
. . . . . . . . L K . C . . .
. . . . . . . . I J E D . . .
. . . . . . . . H G F . . . .
. . . . . . . . . . . . . . .
. . . . . . . . . . . . . . .

Completed 'A' through 'Z'
```

Hint: Use the `srand` and `rand` functions to generate random numbers. After generating a number, look at its remainder when divided by 4. There are four possible values for the remainder (0, 1, 2, and 3) indicating the direction of the next move. Before performing a move, check that (a) it won't go outside the array, and (b) it doesn't take us to an element that already has a letter assigned. If either condition is violated, try moving in another direction. If all four directions are blocked, the program must terminate.

Here is another example of a completed termination for `./randwalk 7 9`:

```
. . . . T S R O N
. . . . U . Q P M
. . . . V . H I L
. . . . W Z G J K
. . . . X Y F E D
. . . . . . . . C
. . . . . . . A B

Completed 'A' through 'Z'
```

Here's an example of a premature termination `./randwalk 5 7`:

```
. . K L C B A
. . J M D . .
. . I N E . .
. . H G F . .
. . . . . . .

The letter N got trapped!
```

`Y` is blocked on all four sides, so there's no place to put `Z`.

Approach: Divide the program into parts. Complete and test each part before moving on.

Divide the program up into methods to provide a structured solution. Some of the methods will be void and others will return values. You will have to make use of parameters, for loops, while loops, and if statements. Do not write all your code in `main()`.

Honor Policy

This assignment is a individual learning opportunity that will be evaluated based on your ability to think independently, work through a problem in a logical manner solve the problems on your own. You may however discuss verbally or via email the general nature of the conceptual problem to be solved with your classmates or the course instructor, but you are to complete the actual assignment without resorting to help from any other person or other resources that are not authorized as part of this course. If in doubt, ask the course instructor. You may not use the Internet to search for solutions to the problem.