CSc 227 — Program Design and Development
Spring 2014 (McCann)

http://www.cs.arizona.edu/classes/cs227/spring14/

Section Activity #7: Using a Stack to Exit a Maze

Your Names: ____

Directions: In groups of two (or three, if need be), complete the following activity. This section activity will be graded; all students in the group will receive the same score. Make sure that the names of all group members are on the page you submit to your section leader. Section Meeting 11 (2014/04/02-03)

Task: In Program #9, you are (going to be) coding a stack-based algorithm that constructs a maze. There's also a stack-based algorithm for finding the exit of your maze from any starting point within it. This section activity asks you to execute that algorithm, completing diagrams along the way to show that you are following it correctly.

Our algorithm is essentially the same as Trémaux's Algorithm, which was designed for people walking a maze, not computers solving virtual mazes. Here's the computer-friendly, stack-based version:

> We start by ordering the four major compass directions. For this activity, we'll use this ordering: S, W, N, E. From your starting position within the maze, start by pushing your location on a stack of locations. Next, attempt to move south (the first direction). If you cannot, try the next direction (west). When you find a direction in which you can move, move one step in that direction, and push this new location on the stack.
>
> Continue until you reach the exit or reach a dead-end – a location in the maze from which the only way out is the way you came in. In this latter case, pop the stack (removing the dead-end), and return to the location currently on the top of the stack. Eventually, you'll return to a location from which you can go in a new direction (e.g., you went west on your first visit, but now you can try north), and you'll move that way. When you reach the exit, the stack contains the route you followed to get there, without all of the dead-ends.

Your task is to use this algorithm to escape from the following maze, entering at (3,0). As you follow the algorithm, you will reach some of the locations marked with Greek letters. When you reach a symbol's location the first time, draw the content of your stack, labeling the stack with the symbol. When you reach Omega (Ω, the exit) and have drawn Ω's stack, you're done. Note that not all of the stacks may be needed.