For lab 4 you wrote a program that created a maze where each cell was reachable from any other cell and there was a unique path from the start to the destination.

Your program works by removing one wall at a time (making sure that the cells separated by that wall were not reachable from each other) until the graph representing the maze has exactly one connected component. If the maze has $n$ cells, your program would remove exactly $n - 1$ walls to reach this situation.

If you removed less than $n - 1$ walls, the resulting maze would have more than one connected component and some cells would not be reachable from the start cell. If you removed more than $n - 1$ walls (notice that after removing $n - 1$ walls, all remaining walls separate cells that are reachable from each other), you could have multiple paths from the source to the destination.

Your task for this lab consists of the following:

1. Modify your maze-building program to allow for both cases mentioned above. Your program should display $n$ the number of cells, and ask the user for $m$, the number of walls to remove, then display a message indicating one of the following:

   (a) A path from source to destination is not guaranteed to exist (when $m < n - 1$)
   (b) There is a unique path from source to destination (when $m = n - 1$)
   (c) There is at least one path from source to destination (when $m > n - 1$)

2. Implement two algorithms to solve the maze you created: breadth-first search and depth-first search. You must apply the two algorithms to find a path from the the start point to the end point and print the paths and found by each algorithm and their lengths. You must use a queue to implement breadth-first search and recursion to implement depth-first search (the stack-based solution is not allowed). You may use the implementations of queues provided by Java or create your own. Compare the running times of your algorithms for different maze sizes.

   As usual, write a report describing your results.

   Given the little time available, a demo will not be required, thus it is very important that your report accurately reflects your work.