1. (3 points) **Unique Paths**

A robot is located at the top-left corner of an \( m \times n \) grid, marked “Start”. See the figure below.

The robot can only move either down or right at any one moment. The robot is trying to reach the bottom-right corner of the grid, marked “Finish” in the diagram below.

How many possible unique paths are there? List all of them.

Use any programming language to solve this problem. You can use either recursion or iteration methods. 2 more bonus points for implementing both two ways.

![Unique Paths Diagram](image)

2. (7 points) **Shortest Path**

Given a diagram represents a chain. See Figure below. The ellipses are variables, and the dots are its two labels. The edges represent a road between two labels and each edge has a real number length.

![Shortest Path Diagram](image)

Write a program to find the shortest path connection between all the variables using dynamic programming. And also generate a random sample input with 100 variables and solve it. A sample solution could be like the edges marked red in the figure below.

![Sample Solution Diagram](image)