Project 3: Random walks in two dimensions. Due Tue Nov 26 by 4 p.m.

Part 1:

Diffusion (simple random walk). Write a program that simulates a random 2D walk with the same step size. Four directions are possible (N, E, S, W). Your program will involve two integers, K is the number of random walks to be taken and N is the maximum number of steps in a single walk. Run your program with at least K = 100. Find the average distance R to be from the origin point after N steps. Plot the mean distance travelled R versus the number of taken steps. Assume that R has the asymptotic dependence as $R \sim N^{\alpha}$, and estimate the exponent α.

Part 2:

Random walk on a 2D crystal. Consider a two dimension lattice of size L*L. Randomly place a "random walker" on the lattice and start walking (only four directions are possible: left, right, up, down). As soon as the random walker reaches a site outside the L*L area the random walk stops. Find the average number of steps S to get out of the crystal. What is the connection between S and L?