1. a) Simulate the path of a simple r.w. $X_n, 0 \leq n \leq N$, on $\mathbf{Z}^2$ starting at zero for $N = 100; 1000; 10000; 100000$ (simulate the trace left by the r.w. $X_n, 0 \leq n \leq N$, on the grid);

b) Simulate the path of a r.w. $X_n, 0 \leq n \leq N$, on $\mathbf{Z}^2$ starting at zero for $N = 100; 1000; 10000$, with

$$\begin{aligned} \mathbf{P}(X_1 = \pm e_2) &= 0.25, \\ \mathbf{P}(X_1 = e_1) &= 0.2, \mathbf{P}(X_1 = -e_1) = 0.3, \end{aligned}$$

where $e_1 = (1, 0), e_2 = (0, 1)$.

2. Consider a simple r.w. X_n on $\mathbf{Z}$ starting at zero. Let $T = \inf\{n \geq 1 : X_n = 0\}$ and $T_L = \min\{T, L\}$. Plot T_L for m simulated trajectories of X_n: plot the values that you found $(T_L^1, \ldots, T_L^m)$ against $(1, 2, \ldots, m)$ for $m = 20, L = 100; m = 200, L = 1000; m = 2000, L = 100000$.