

Exercise:

A random walk starts from the center of an $N \times N$ grid, ends when a boundary is reached. In this question we are going to deal with a variation of random walk.

Suppose you have an $N \times N$ grid where N is an odd number. Starting from the center grid, you are allowed to move to any of the 8 neighboring grids (refer to *Figure-1*).

Moreover, keep in mind that when we reach to a boundary, we are not restricted with some of the directions, instead we are able to use all the directions. However, you need to assume that the grid has invisible walls (as in the newer version of game *Snake* published by Nokia)

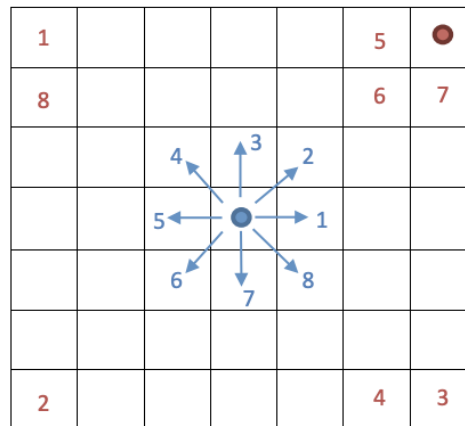


Figure-1: Random Walk with Invisible Walls for a 7x7 Grid

With these rules, we expect from you to find the average number of steps to reach a certain cell, which will be provided by the user, for $N=21$, $N=201$, and $N=2001$. You can assume that we are going to visit the cells within 21×21 grid, i.e. you do not need to check whether the requested cell exists in the grid.

>> Which cell do you need to visit?

(3,5)

For $N=21$: The cell (3,5) is visited in 53 steps on average.

For $N=201$: The cell (3,5) is visited in 20 steps on average.

For $N=2001$: The cell (3,5) is visited in 72 steps on average.

Please note that these numbers are representative!