

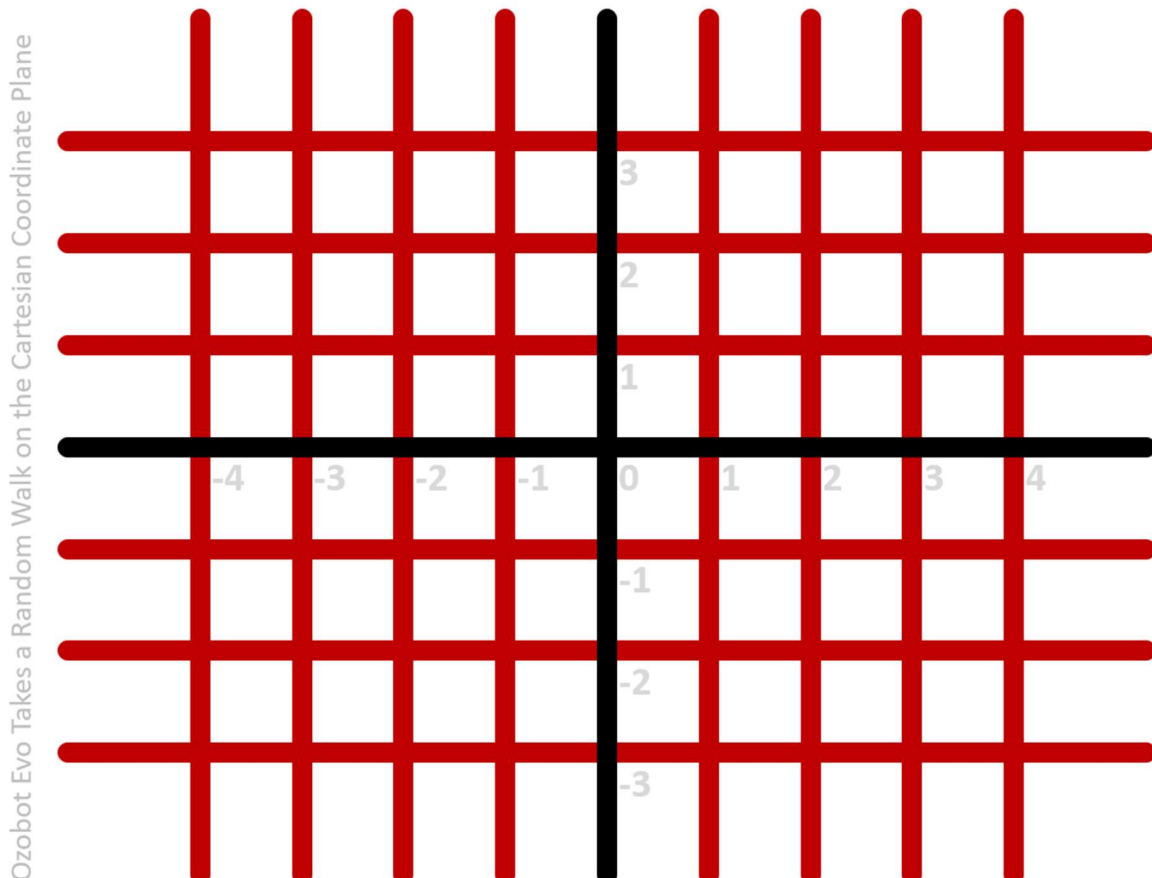
Evo Challenge Lesson: Random Walk on Cartesian Plane with Turn Counts

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A random walk is the path that results from a succession of random steps. Random walks can be made on a one-dimensional number line, a two-dimensional lattice such as the Cartesian coordinate system, and even in three dimensions or higher. The study of random walks has been applied to many fields including economics and modeling of share prices, physics and Brownian motion of molecules of gasses or liquids, and in computer science to estimate the size of the World Wide Web, just to mention a few.

Ozobot Evo can be easily programmed to take random walks, and it is fun to watch him as he moves about. In this challenge, you will be programming Ozobot Evo to take a random walk using line-following on a finite Cartesian coordinate plane. Programming it is a tad easier if the plane is infinite in all directions, but such a plane is difficult to draw on a piece of paper.

Program Ozobot to take a 40-step random walk on the Cartesian coordinate plane using a printout of the Ozomap on the last page of this handout. A small version is shown in the figure below for ready reference while studying the challenge program requirements.



Program Requirements:

1. Ozobot should be moving fast (65 mm/s), though you might want him to move much slower while you are building and debugging your program.
2. Ozobot should initially be placed on the Cartesian plane's origin at (0, 0) facing in the positive y direction.
3. Turn Evo on and then start the program by pressing the button twice.
4. All steps are to be one Cartesian unit long.
5. Ozobot's first step will be to move straight from (0, 0) to (0, 1). Thereafter, his remaining 39 steps should be random. While he is within the coordinate plane, he randomly moves either:
 - a. One step straight ahead.
 - b. One step to the right.
 - c. Or one step to the left

each of the above three with equal probabilities.

6. The only time Ozobot should move "back" is when he reaches any of the line ends at the top, bottom, left, or right of the maze.
7. When Ozobot has completed his 40-step random walk including "back" moves, he should immediately stop and then speak the number of right, left, straight and back turns that he executed during the walk, in that order.
8. Note that as a check, the sum of the four counts should be 40.
9. After displaying the four counts Ozobot should turn off.

