**Program Structures and Algorithms**

**Assignment 1**

**Random Walk**

**Question:**

Imagine a drunken man who, starting out leaning against a lamp post in the middle of an open space, takes a series of steps of the same length: 1 meter. The direction of these steps is randomly chosen from North, South, East or West. **After n steps, how far (d), generally speaking, is the man from the lamp post?** Note that d is the Euclidean distance of the man from the lamp-post. It turns out that there is a relationship between d and n which is typically applicable to many different types of stochastic (randomized) experiments. Your task is to implement the code for the experiment and, most importantly, to **deduce the relationship**.

**Conclusion:**

Based on the analysis of random steps from 1 to 40, I approximately came into a conclusion that the relationship between distance(d) and steps(n) is

**Explanation:**

To get to this conclusion we assume lamp post as the origin and the drunken man walking in a coordinate system.

So from his current position let us consider it as (x,y) then the distance will be

**Approximate Observations based on my logic:**

4 steps: 1.7953959500210694 over 40 experiments

39 steps: 4.482532633092137 over 40 experiments

34 steps: 4.475439850062056 over 40 experiments

11 steps: 3.0971020884834237 over 40 experiments

5 steps: 1.989328051917377 over 40 experiments

21 steps: 4.005883573078728 over 40 experiments

12 steps: 3.4439039752765033 over 40 experiments

23 steps: 4.313141089624555 over 40 experiments

21 steps: 4.16386727262933 over 40 experiments

31 steps: 4.878146952475692 over 40 experiments

7 steps: 2.1915536194862657 over 40 experiments

30 steps: 4.706151523344063 over 40 experiments

7 steps: 2.381505655626643 over 40 experiments

32 steps: 4.903244976774222 over 40 experiments

6 steps: 1.9806550339765578 over 40 experiments

So based on the above observations we can approximately conclude the relation as **d=**.

**Evidence(Graph, Output and Testcases):**

All test cases have been passed.

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