Program Structures & Algorithms
Spring 2022
Assignment No. 1 (Random Walk)

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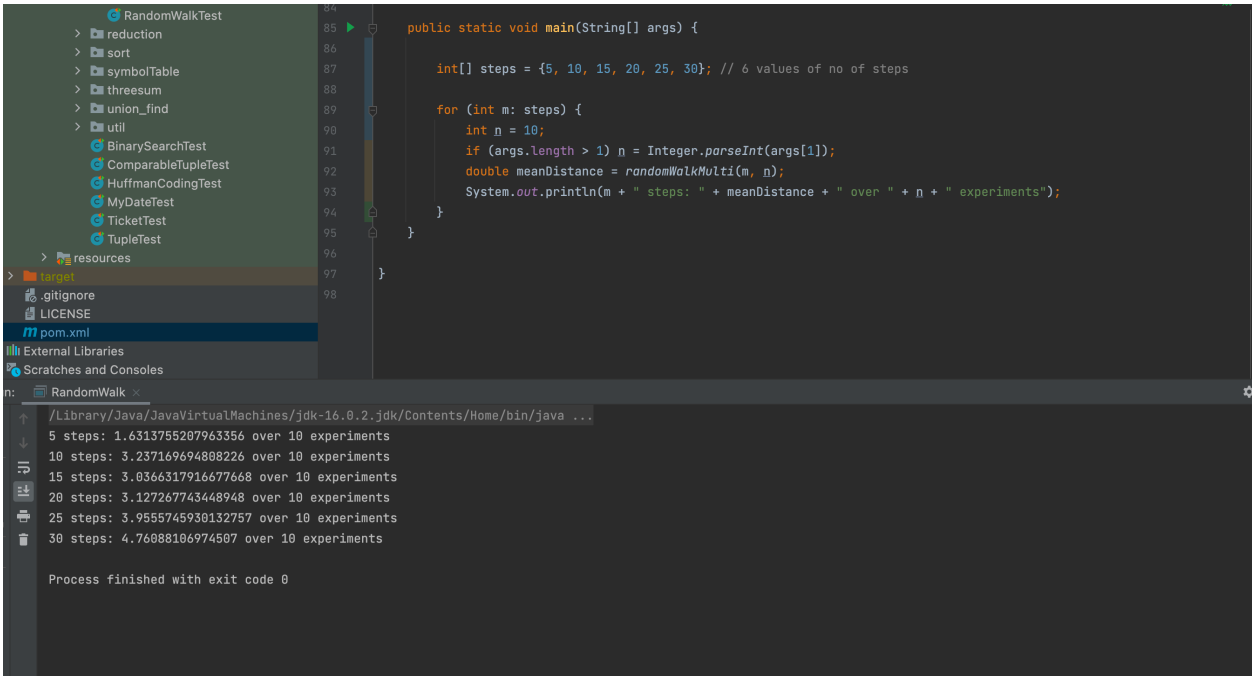
- **Task**

  Completed the RandomWalk.java file which had below methods implemented.
  - move() – void method which increments x and y variables as the drunken person moves in north, south, east or west direction.
  - distance() – returns the Euclidean distance (using Pythagoras Theorem) of the drunken man from the pole (origin) to a point (d)
  - randomWalk() – void method where the randomMove() method is called for the m no of steps in random di**rec**tion

- **Output screenshot**

The below output is tested on 6 different steps and running the experiment 10 times for each no. of tests.



- ## Relationship Conclusion

  The relationship between the Euclidean Distance (d) from the pole and number of steps taken to reach position by n steps is

  $d \approx \sqrt{n}$

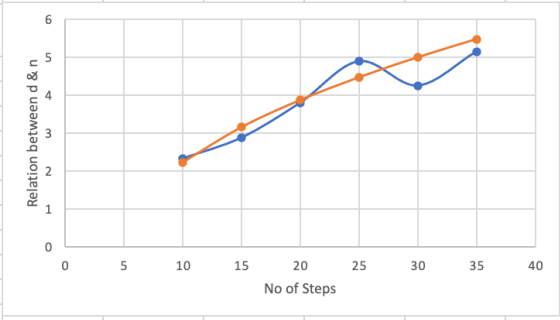
- ## Evidence / Graph

Mapped the values of the mean distance from pole after n steps and the square root of n steps on a scatter plot proving the relation between d & n has no outliers and they are almost equal.

No of

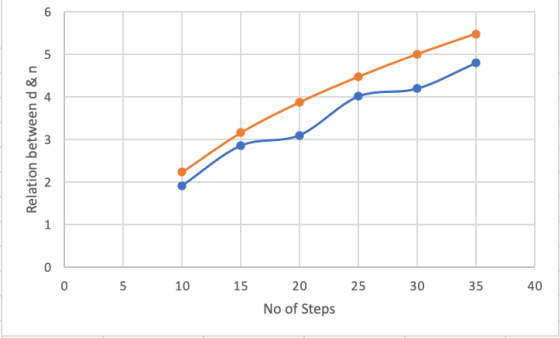
m = 10

n (Steps)	Mean Distance from pole after n steps	Square root of n
10	2.339144244	2.236067977
15	2.886242333	3.16227766
20	3.803072593	3.872983346
25	4.890174281	4.472135955
30	4.251454806	5
35	5.144573857	5.477225575



m = 100

n (Steps)	Mean Distance from pole after n steps	Square root of n
10	1.918397924	2.236067977
15	2.855819628	3.16227766
20	3.101353144	3.872983346
25	4.011204216	4.472135955
30	4.1944618	5
35	4.795001431	5.477225575



- **Unit tests result**

Below screenshot of all test cases ran successfully.
Additionally showing the git history that the RandomWalkTest.java file is not modified.