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INFO 6205

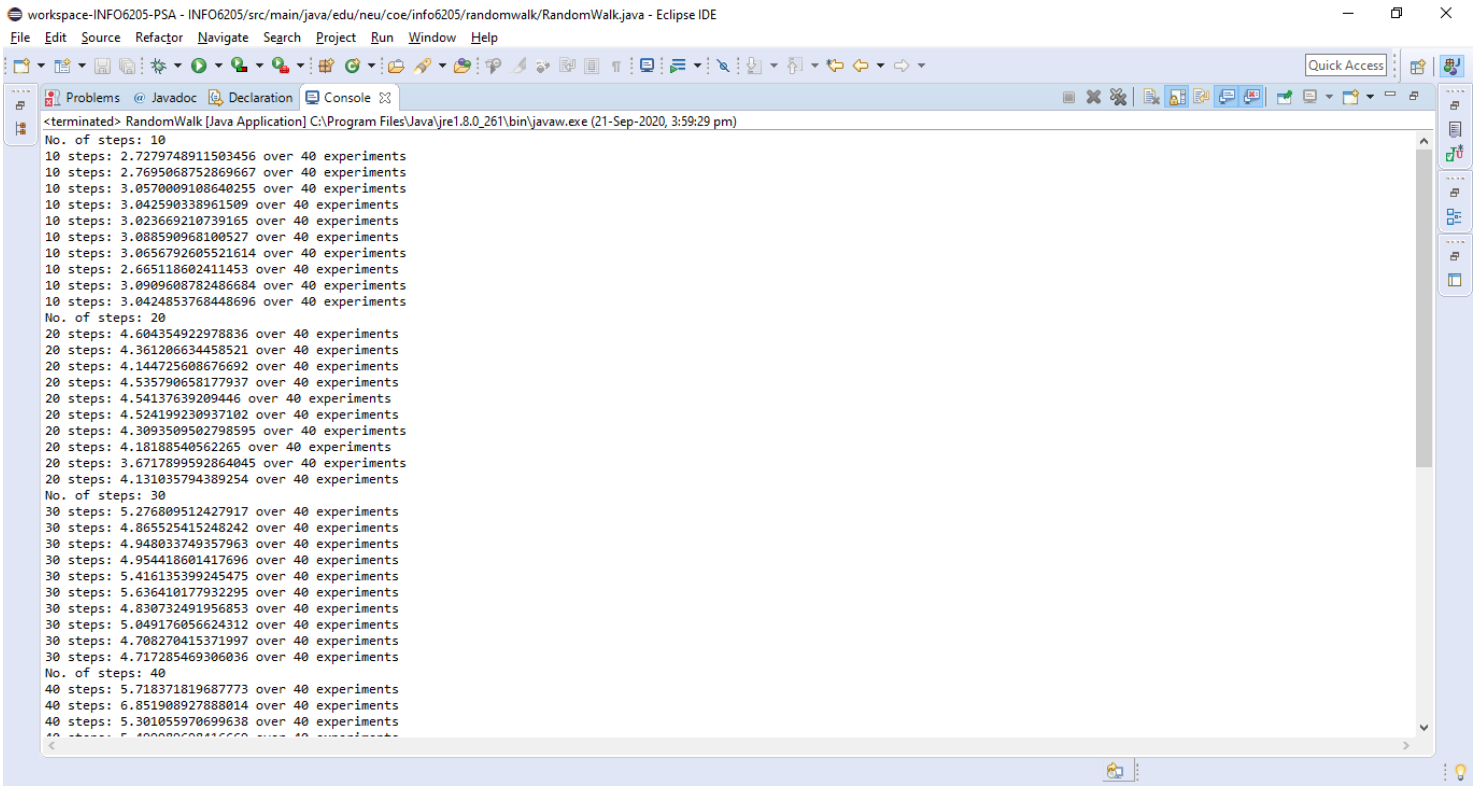
Program Structures & Algorithms

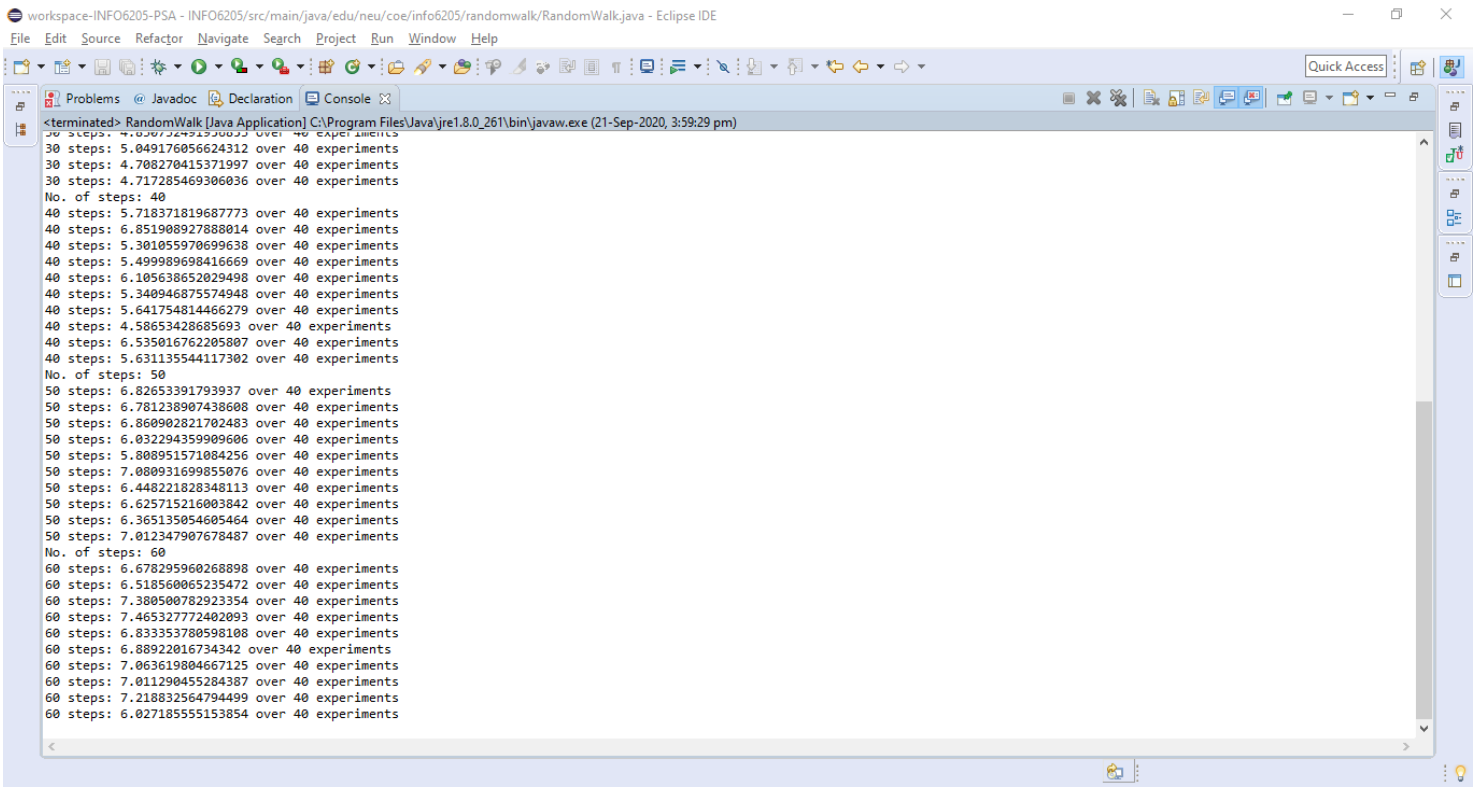
Fall 2020

Assignment No: 1

- **Task:** To implement the code and deduce the relationship between number of steps (n) and Euclidean distance (d) of a drunken man from the lamp post through many different types of randomized experiments.

- **Output**: Below is the output received for 6 different values of n (number of steps) ran 10 times each to prove the relationship –





- **Relationship conclusion:** It can be concluded from the results of the experiments that the Euclidean distance between the final position and the initial position of a drunken man moving is approximately equal to the root of the number of steps taken Or in other words, the root mean square of the distance d, between the two points should be approximately root of the number of steps i.e. $\sqrt{N}$. So, $\boxed{D = \sqrt{N}}$

- **Evidence to support relationship**: I have attached a chart and a table stating the data of the different output observed for the different set of inputs of N. As a result, we can see proportionate increase in the distance covered. Hence supporting our observation that D is the root mean square of N.

Number of Steps (n)	Expected Distance $\sqrt{N}$	Avg. Calculated Distance D	Error (%)
10	3.16	3.075	2.68
20	4.47	4.52	1.18
30	5.47	4.83	11.7
40	6.32	5.32	15.8
50	7.07	6.86	2.97
60	7.74	7.38	4.65

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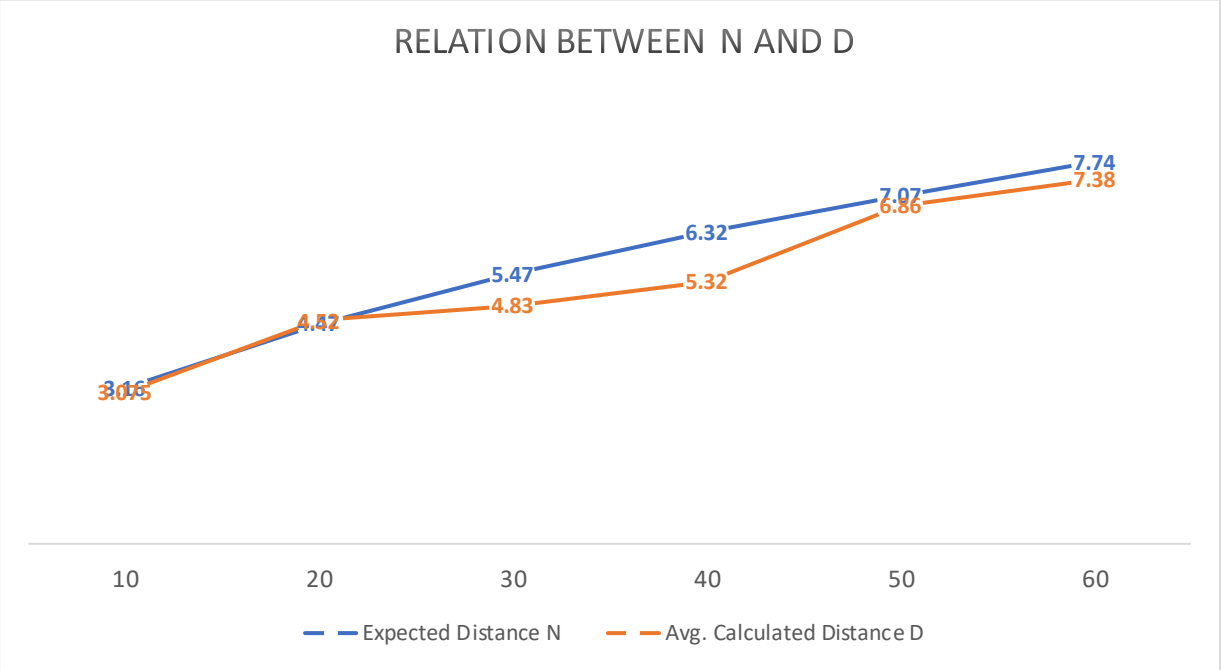

- **Screenshot of Unit test passing:** Below is the screenshot of all the unit tests which ran successfully