ANURAG PARLA (002127710)

Program Structures & Algorithms
Fall 2021

Assignment No. 01

Task:

- To implement a code to calculate the euclidean distance ‘d’ between a drunk man and a lamp post(starting point/origin) after he travels by walking ‘n’ steps in random directions.
- To deduce the relationship between the Euclidean distance ‘d’ the total number of steps ‘n’ taken by the drunk man.

Relationship Conclusion:

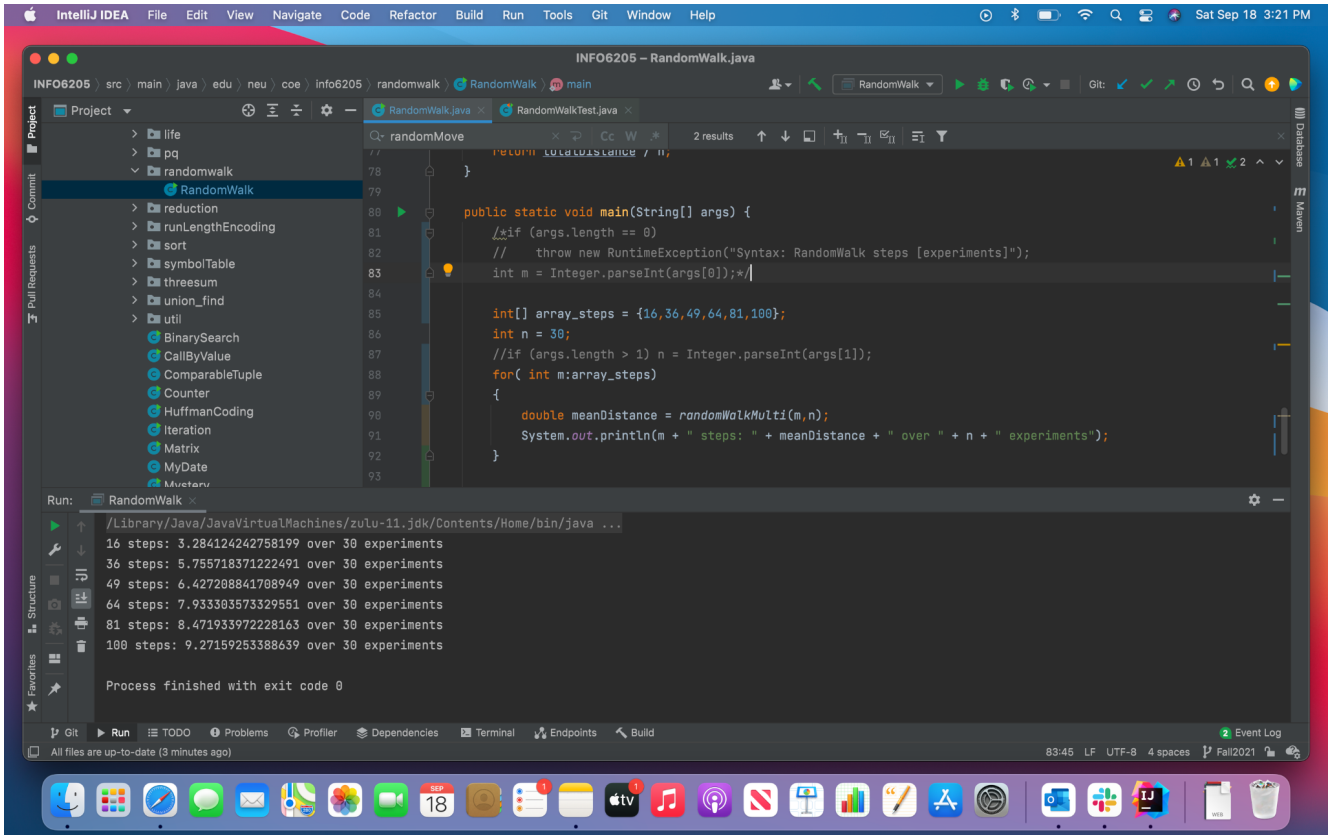
Hence, after performing the experiment 30 times for various steps viz; {16,36,49,64,81,100} taken by the drunk man it is observed that distance ‘d ‘is approximately equal to the square root of ‘n’ number of steps.
i.e, **d≅sqrt(n)**

Evidence to support the conclusion:

Mathematical value of d obtained after executing the program for 6 different values of ‘n’ with over 30 experiments for each value of ‘n’.

```
16 steps: 3.284124242758199 over 30 experiments
36 steps: 5.755718371222491 over 30 experiments
49 steps: 6.427208841708949 over 30 experiments
64 steps: 7.933303573329551 over 30 experiments
81 steps: 8.471933972228163 over 30 experiments
100 steps: 9.271592533886639 over 30 experiments
```

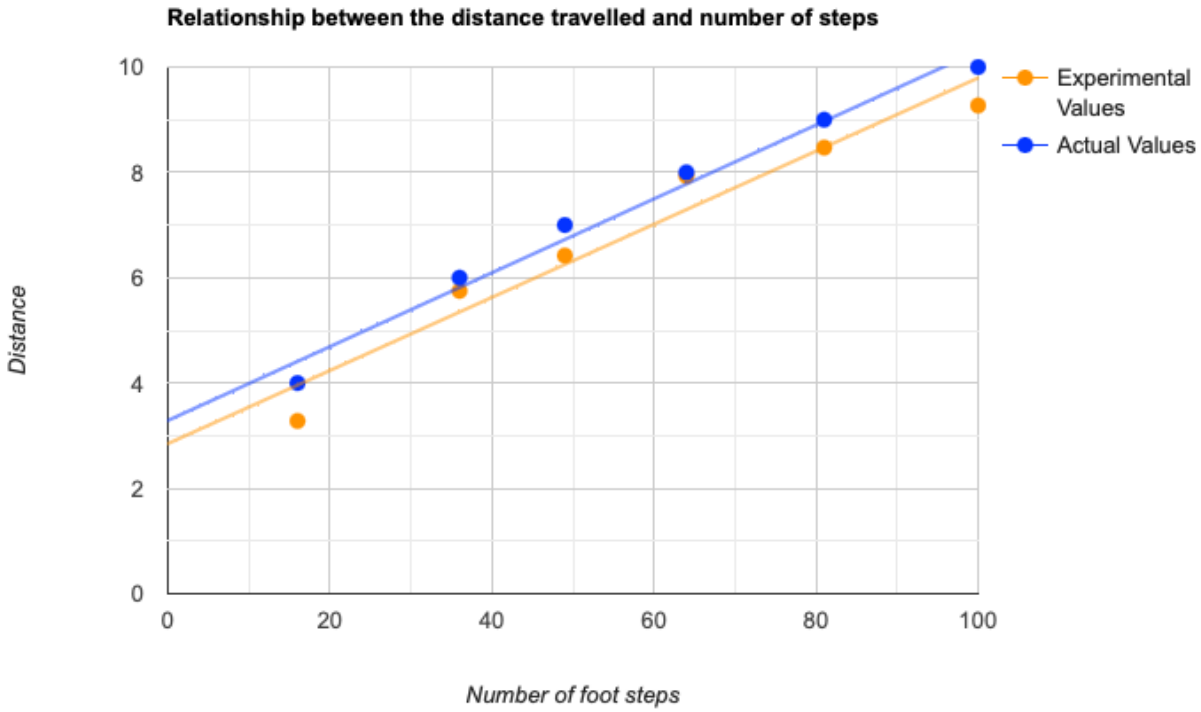
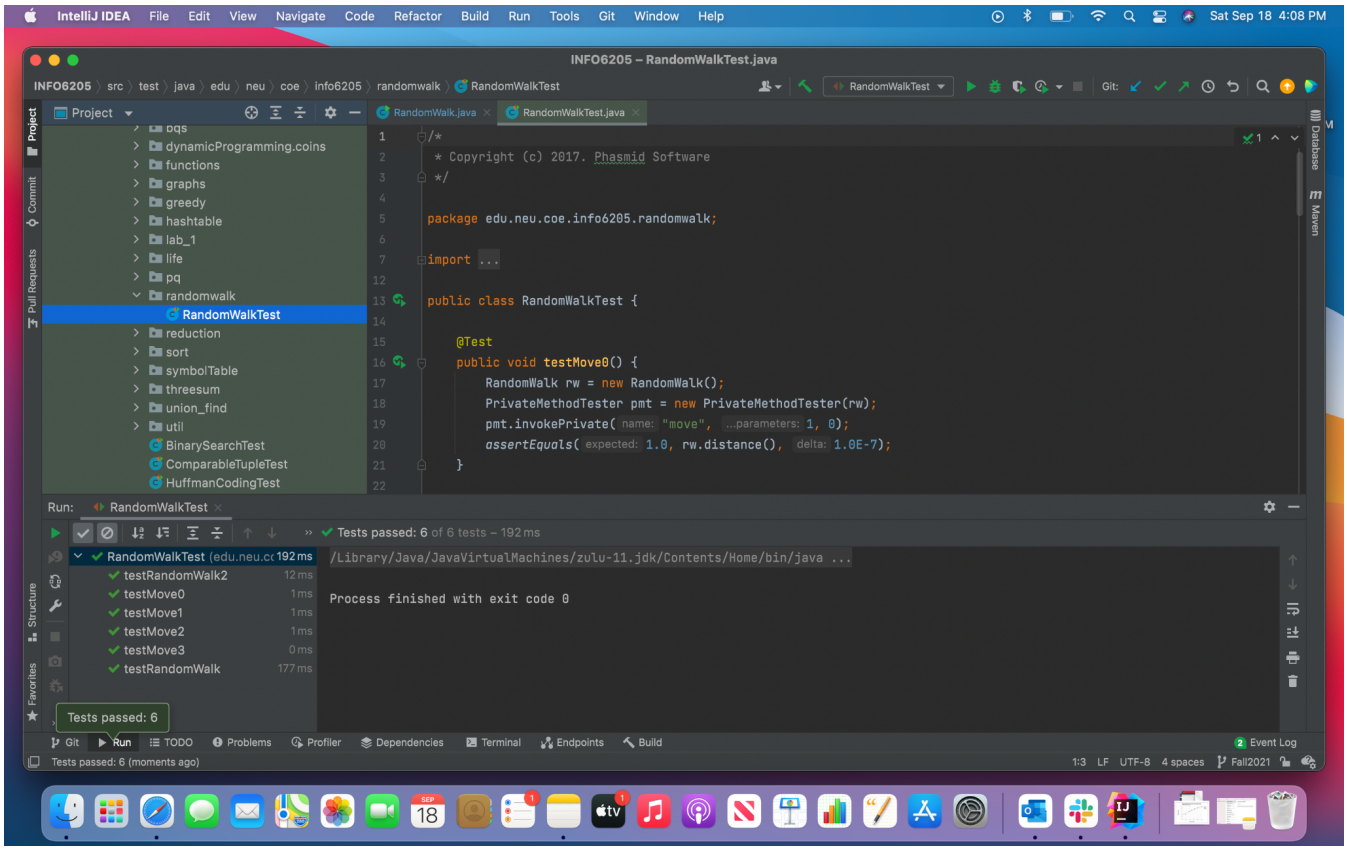
Following is the snapshot of the code snippet in which the custom input is being passed i.e. the 6 different number of footsteps and the corresponding distance is displayed on the console after conducting 30 experiments for each value of ‘n’.



The table below indicates the actual value and the experimental value of distance ‘d’ in order to support the relationship between ‘d’ and ‘n’.

No. of steps ‘n’	d = sqrt(n)	Distance obtained from the experiment	Difference percentage (%)
16	4	3.28	18
36	6	5.75	4.17
49	7	6.43	8.14
64	8	7.93	0.875
81	9	8.47	5.88
100	10	9.27	7.3

Following is the scatter plot representing the relationship between the distance and the number of steps walked by the drunk man.



Unit tests result: