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Program Structures & Algorithms INFO6205

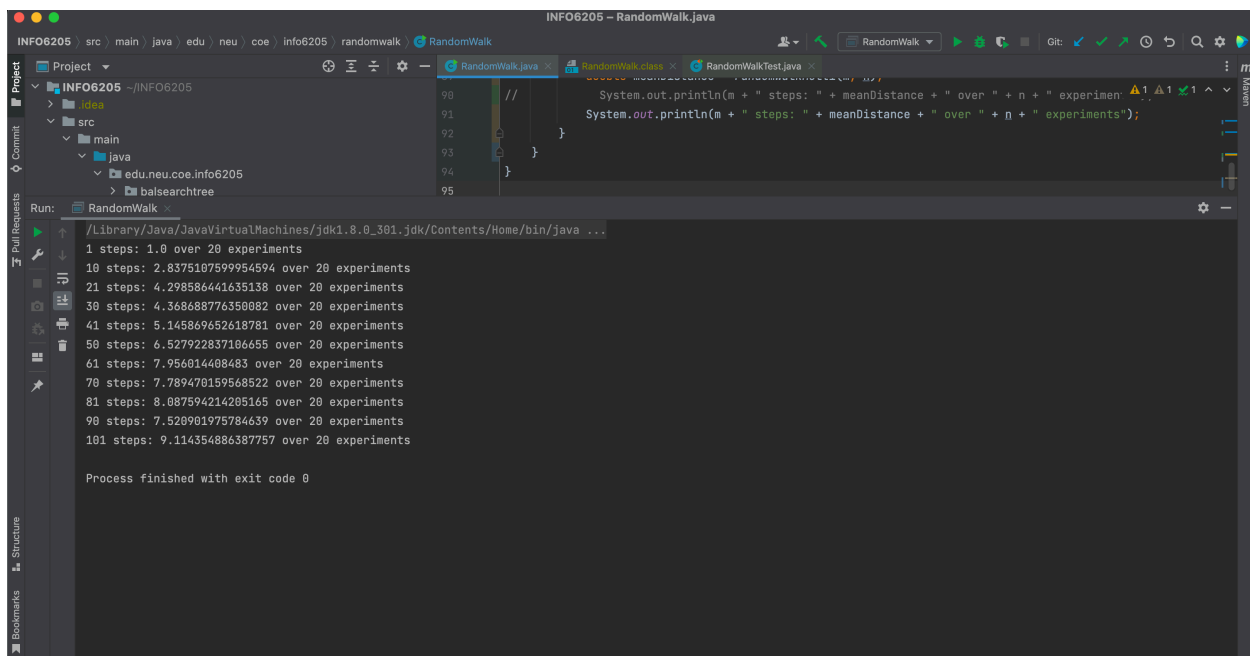
Assignment 1

Task Performed :

Following is the task performed or functions called in the assignment

- Implemented move(), randomWalk(), distance() function from the main function in order to generate the necessary output for the conclusion
- Modified the main function to get the results for the plots to implement
- Established the relationship between d and n

Output ScreenShot :



```
INFO6205 - RandomWalk.java
Project: INFO6205
src: main
java: edu.neu.coe.info6205
main: java
edu.neu.coe.info6205
balsearchtree

Run: RandomWalk
/Library/Java/JavaVirtualMachines/jdk1.8.0_301.jdk/Contents/Home/bin/java ...
1 steps: 1.0 over 20 experiments
10 steps: 2.8375107599954594 over 20 experiments
21 steps: 4.298586441635138 over 20 experiments
30 steps: 4.368688776350082 over 20 experiments
41 steps: 5.145869652618781 over 20 experiments
50 steps: 6.527922837106655 over 20 experiments
61 steps: 7.956014408483 over 20 experiments
70 steps: 7.789470159568522 over 20 experiments
81 steps: 8.087594214205165 over 20 experiments
90 steps: 7.520901975784639 over 20 experiments
101 steps: 9.114354886387757 over 20 experiments

Process finished with exit code 0
```

After 11 different steps, every 20 experiments, the mean distance is printed above from the main function. Where process exit code states program ran successfully hence not adding that screenshot

Relationship Conclusion :

$$d = \sqrt{n}$$

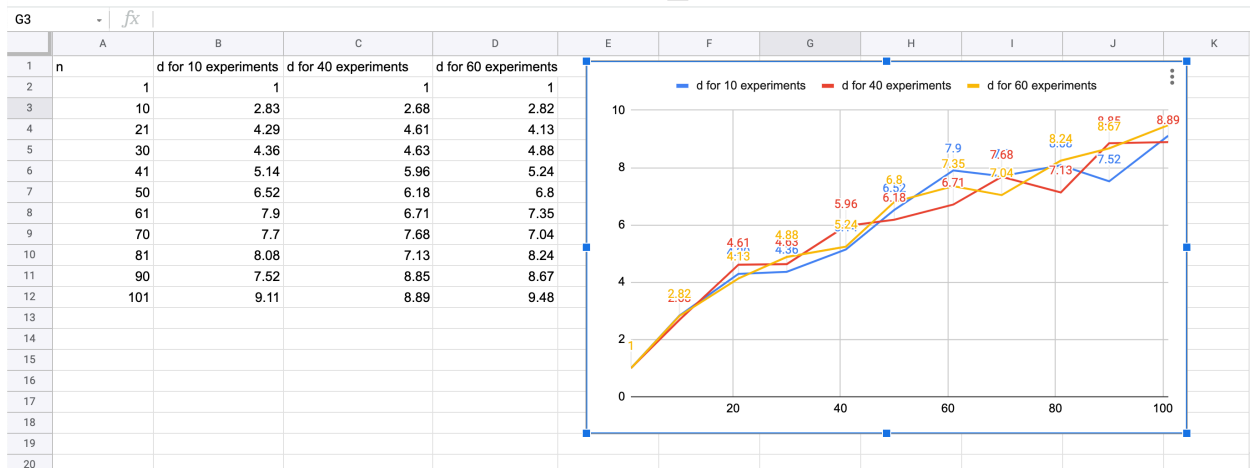
My Take :

Although this relationship is true, it is actually the overall combinations of or the combined result of d is directly proportional to n and d is the hypotenuse distance from n

$$\text{Another way of my note, } d = X^2 + Y^2$$

But since $x = y = \text{similar}$, one equal step, (does not change with direction) comes as $d = \sqrt{n}$

Evidence and Plots :



Here, multiple experiments are being considered for more accuracy. We can that for other experiments the output is almost similar which proves the logic validity

From the trendline in the left graph,

$$y = 7.9x - 7.35x$$

which is similar to

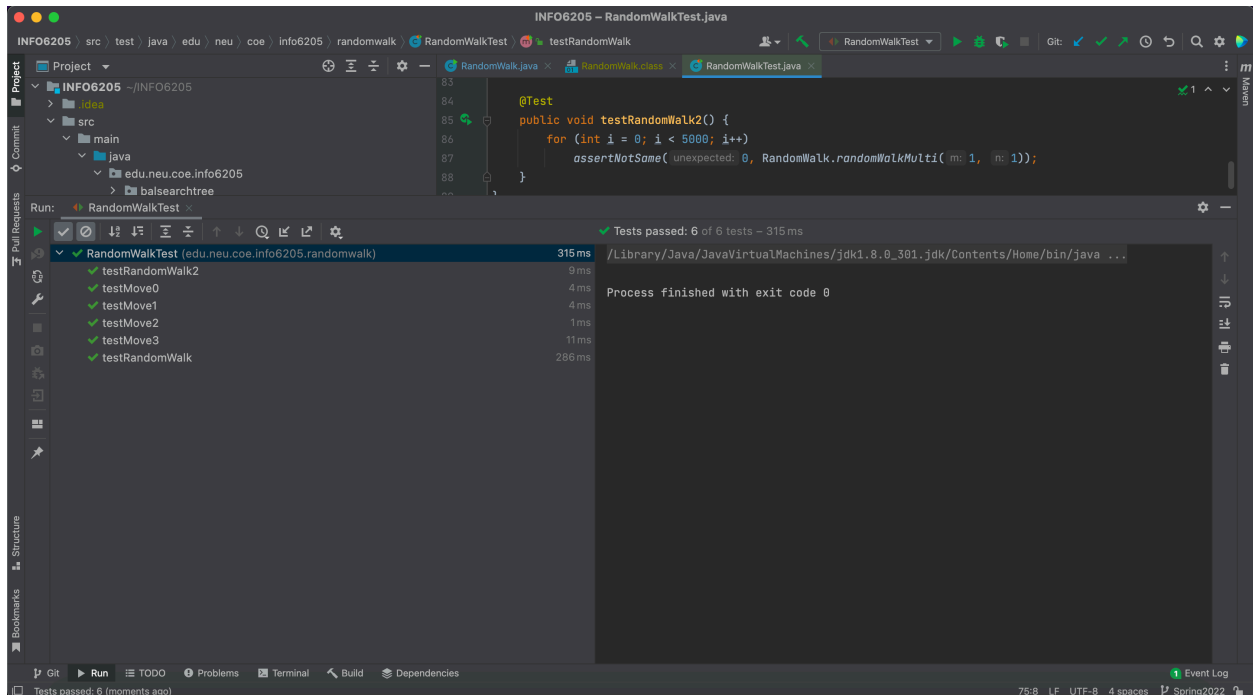
$$y = x \text{ (approx 8) ,}$$

$$y (60) = x (8)$$

relationship quotient : $n = d^2$

Thus, we can **Conclude** : $d = \sqrt{n}$.

Unit Test Results :



This screen shot shows that all the unit test ran properly with expected output for all the function in the program flow