Assignment 1 - Program Structures & Algorithms Fall 2021

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Task

- Implement the `RandomWalk` class
- Run experiments to get the relation between `d` and `N`

Conclusion

$$d = 0.8876\sqrt{N} - 0.005$$

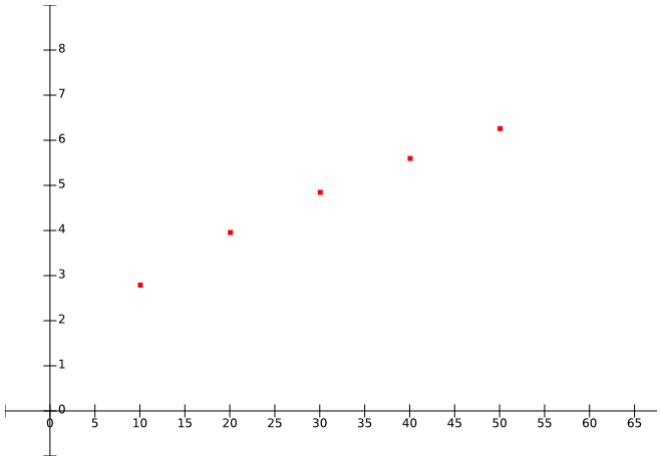
Evidence

For each `N`, 10,000,000 experiments were performed to get more stable mean value of `d`.

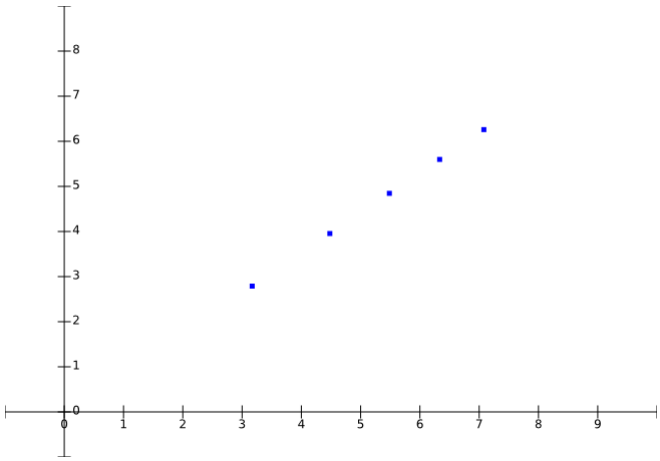
Below are the test results:

N	d	sqrt(N)
10	2.800	3.162
20	3.966	4.472
30	4.857	5.477
40	5.609	6.325
50	6.270	7.071

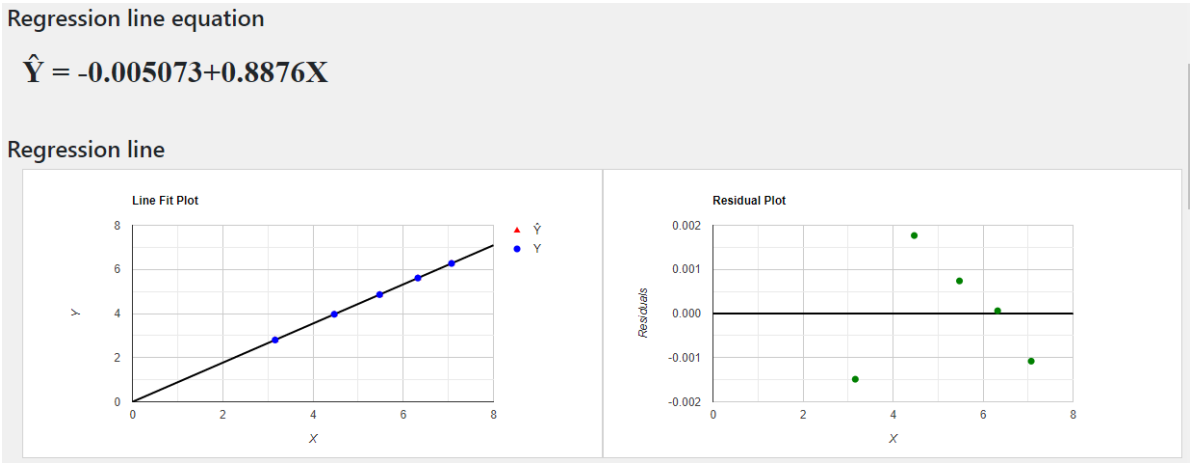
Tried plotting the data point with `N` as X-axis and `d` as Y-axis, we got the graph below:



It looks like there is a relation but not a perfect linear relation. As the distance formula used square root operation, we can also try using `sqrt(N)` as X-axis and `d` as Y-axis:



This seems like a perfect linear relation, we can use [online linear regression tool] to get the formula. Enter the data points, and we got:



Code

Only `RandomWalk.java` is modified.

Unit tests