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Program Structures & Algorithms

Fall 2021

Assignment No. 1

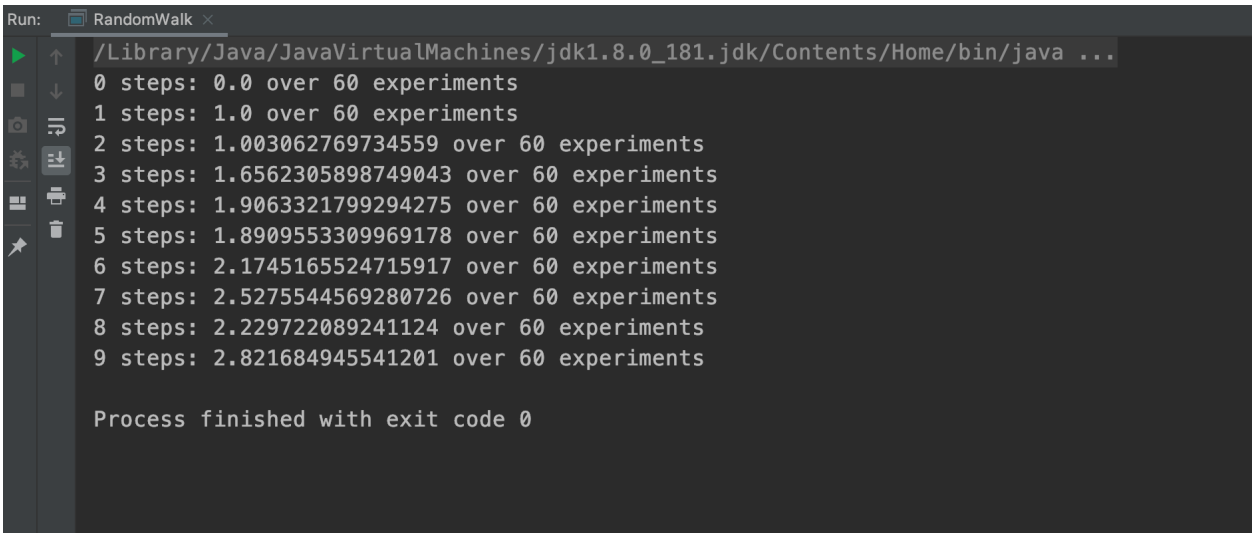
- **Task (List down the tasks performed in the Assignment)**

  1. Implement #move()、#randomWalk()、#distance() methods
  2. Change the main program to print the experiment result
  3. deduce the relationship between d and n
  4. get success unit tests result

- **Relationship Conclusion: d = $\sqrt{n}$**

- **Evidence to support the conclusion:**

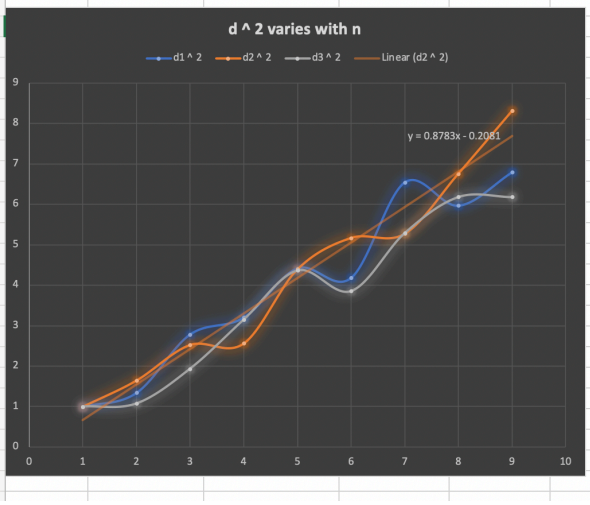
1. **Output**

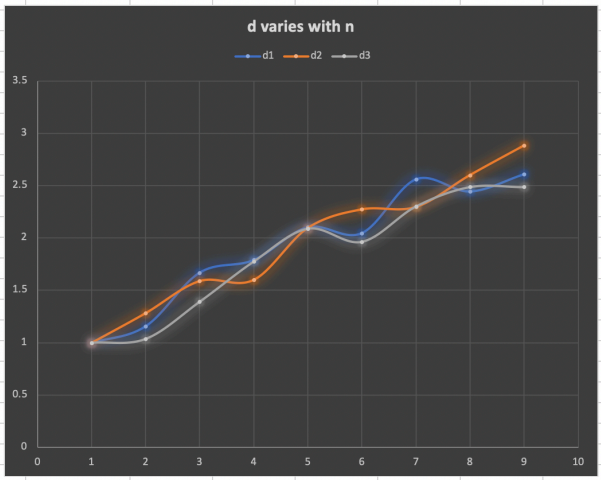


After 10 different steps, each 60 experiments, the mean distance of each showed like above.

2. Graphical Representation

	A	B	C	D	E	F	G
1	n	d1	d2	d3	d1 ^ 2	d2 ^ 2	d3 ^ 2
2	1	1	1	1	1	1	1
3	2	1.158291245	1.283536555	1.036396103	1.341638608	1.6474661	1.074116882
4	3	1.66896279	1.589563923	1.391421526	2.785436795	2.5267135	1.936053864
5	4	1.790001214	1.601129565	1.775729334	3.204104346	2.5636159	3.153214669
6	5	2.10250892	2.096109377	2.090120376	4.42054376	4.3936745	4.368603188
7	6	2.045911082	2.273927011	1.964163903	4.185752154	5.1707441	3.85793984
8	7	2.558512365	2.296607282	2.301310754	6.545985524	5.274405	5.296031185
9	8	2.443400995	2.600480355	2.48730594	5.970208425	6.7624981	6.186690842
10	9	2.606679642	2.883266243	2.486894778	6.794778757	8.3132242	6.184645637





d1、d2、d3 demonstrates 3 random main program results(mean distance after 600 times' experiments) ; n demonstrates steps. From the trendline in the left graph, y = 0.8783x – 0.2081 which is similar to y = x(d^2 = n). Thus, we can conclude from the graph that d = $\sqrt{n}$.

- **Unit tests result:**