PSA

ASSIGNMENT 1 (RANDOM WALK)

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SECTION 1

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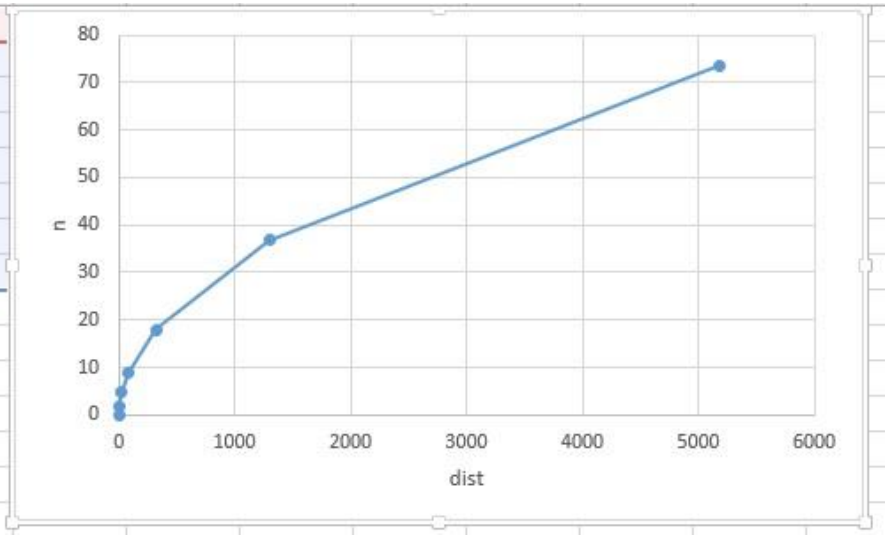
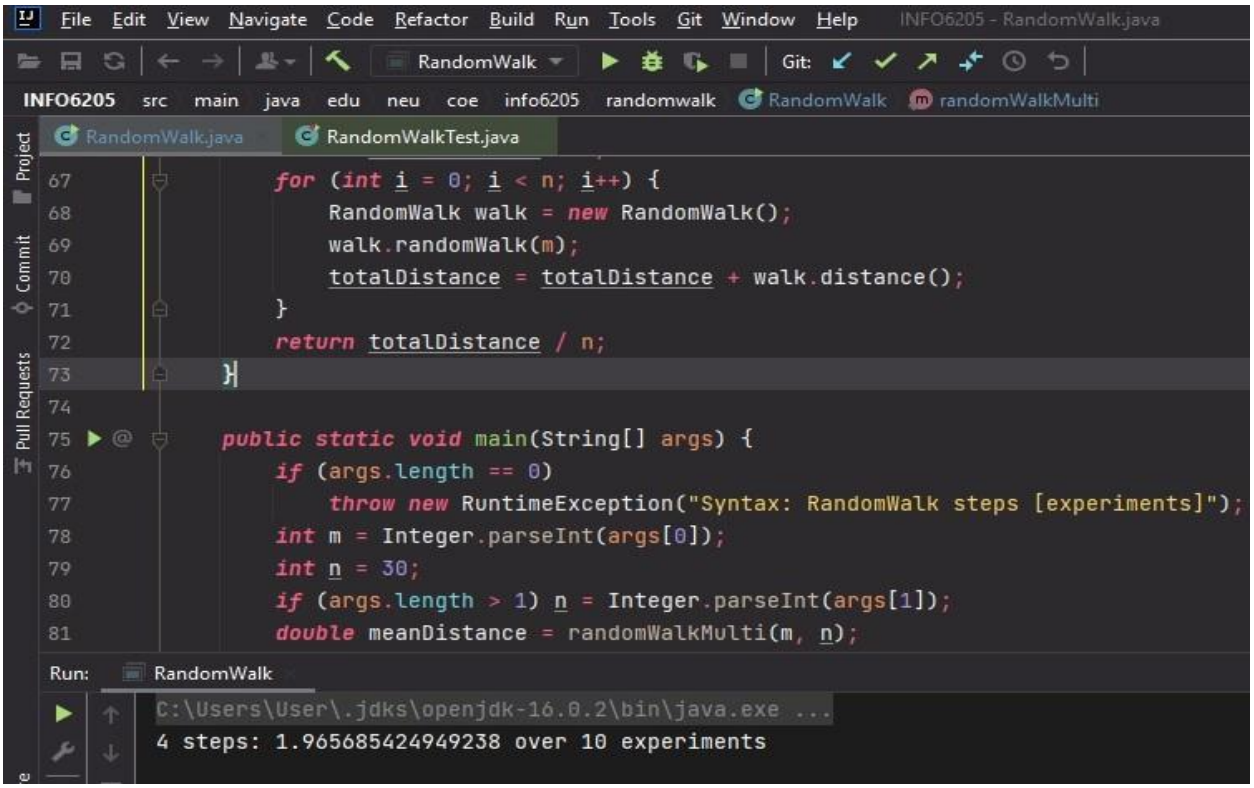
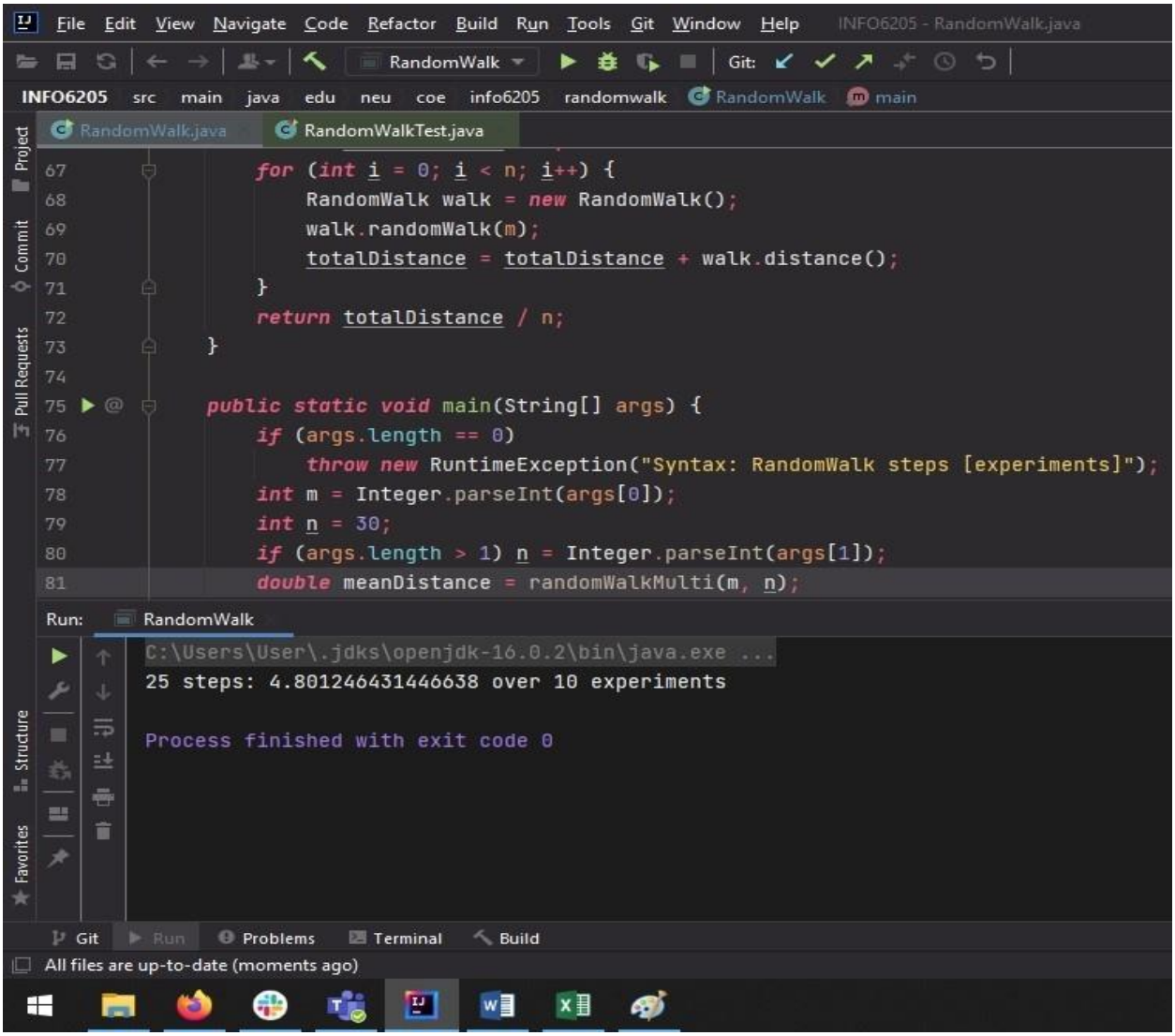
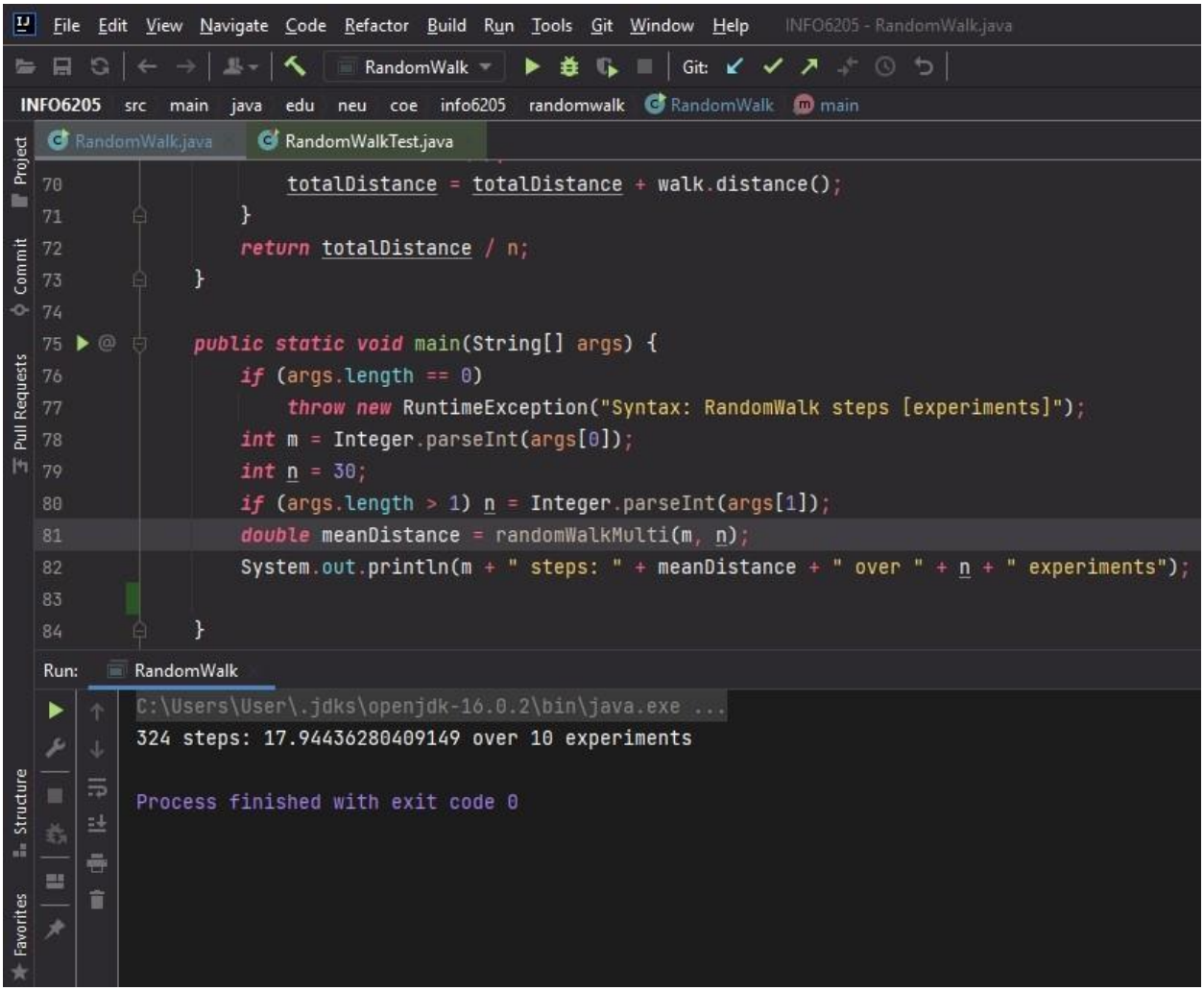
1) The relationship between d (Euclidean distance) and n (steps) is that **d = √n.**
2) Graph as evidence to support the relationship.

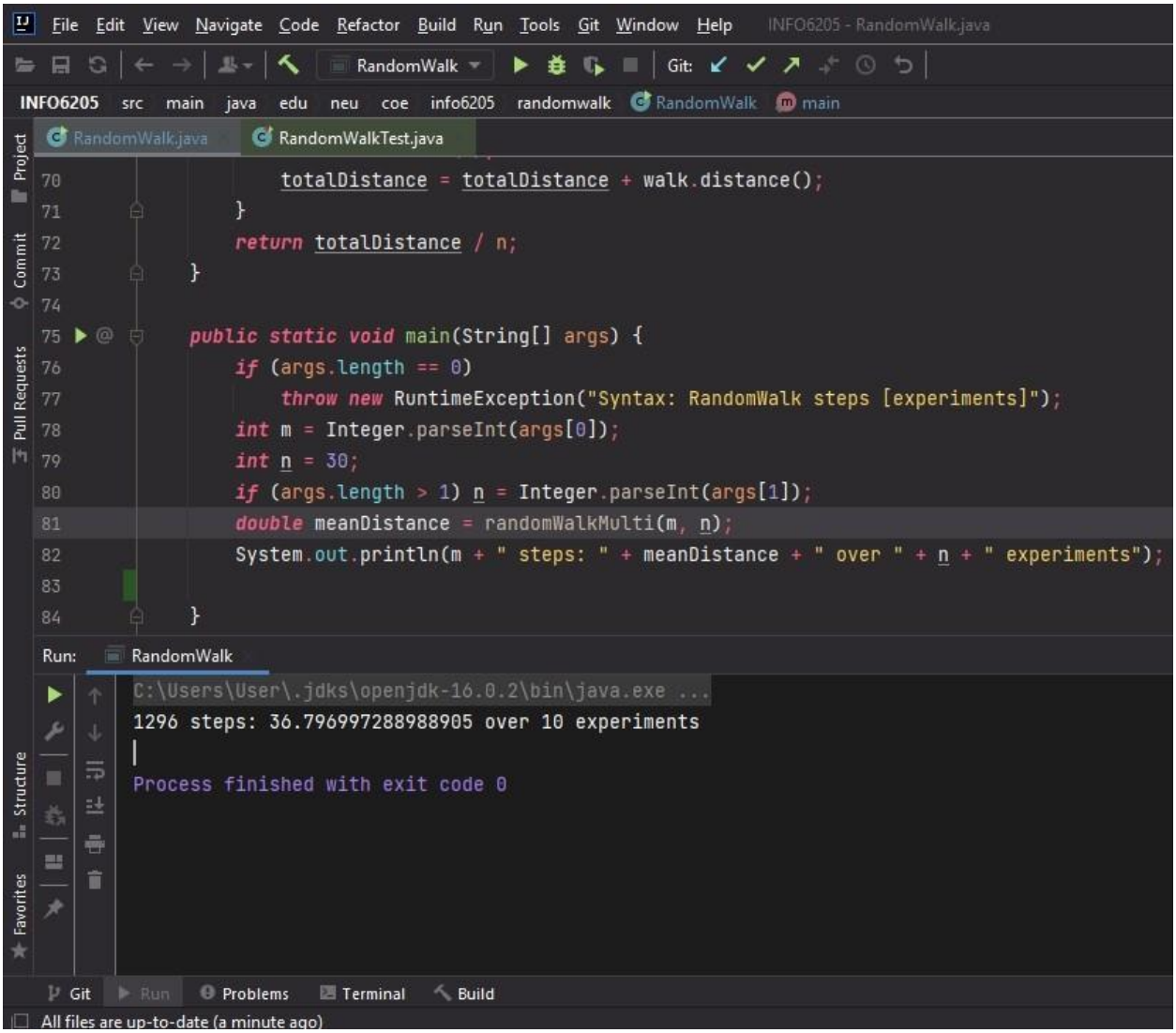
n	dist
0	0
4	1.965685425
25	4.801246431
81	8.945668907
324	17.9443628
1296	36.79699729
5184	73.59210007






File Edit View Navigate Code Refactor Build Run Tools Git Window Help
INFO6205 - RandomWalk.java
RandomWalk
Git:
INFO6205 src main java edu neu coe info6205 randomwalk RandomWalk main
RandomWalk.java
RandomWalkTest.java
for (int i = 0; i < n; i++) {
RandomWalk walk = new RandomWalk();
walk.randomWalk(m);
totalDistance = totalDistance + walk.distance();
}
return totalDistance / n;
}
public static void main(String[] args) {
if (args.length == 0)
throw new RuntimeException("Syntax: RandomWalk steps [experiments]");
int m = Integer.parseInt(args[0]);
int n = 30;
if (args.length > 1) n = Integer.parseInt(args[1]);
double meanDistance = randomWalkMulti(m, n);
Run: RandomWalk
C:\Users\User\.jdks\openjdk-16.0.2\bin\java.exe ...
25 steps: 4.801246431446638 over 10 experiments
Process finished with exit code 0
Git Run Problems Terminal Build
All files are up-to-date (moments ago)


File Edit View Navigate Code Refactor Build Run Tools Git Window Help
INFO6205 - RandomWalk.java
RandomWalk
Git:
INFO6205 src main java edu neu coe info6205 randomwalk RandomWalk main
RandomWalk.java
RandomWalkTest.java
totalDistance = totalDistance + walk.distance();
}
return totalDistance / n;
}
public static void main(String[] args) {
if (args.length == 0)
throw new RuntimeException("Syntax: RandomWalk steps [experiments]");
int m = Integer.parseInt(args[0]);
int n = 30;
if (args.length > 1) n = Integer.parseInt(args[1]);
double meanDistance = randomWalkMulti(m, n);
System.out.println(m + " steps: " + meanDistance + " over " + n + " experiments");
}
Run:
RandomWalk
C:\Users\User\.jdks\openjdk-16.0.2\bin\java.exe ...
324 steps: 17.94436280409149 over 10 experiments
Process finished with exit code 0
Project
Commit
Pull Requests
Structure
Favorites


File Edit View Navigate Code Refactor Build Run Tools Git Window Help
INFO6205 - RandomWalk.java
RandomWalk
Git:
INFO6205 src main java edu neu coe info6205 randomwalk RandomWalk main
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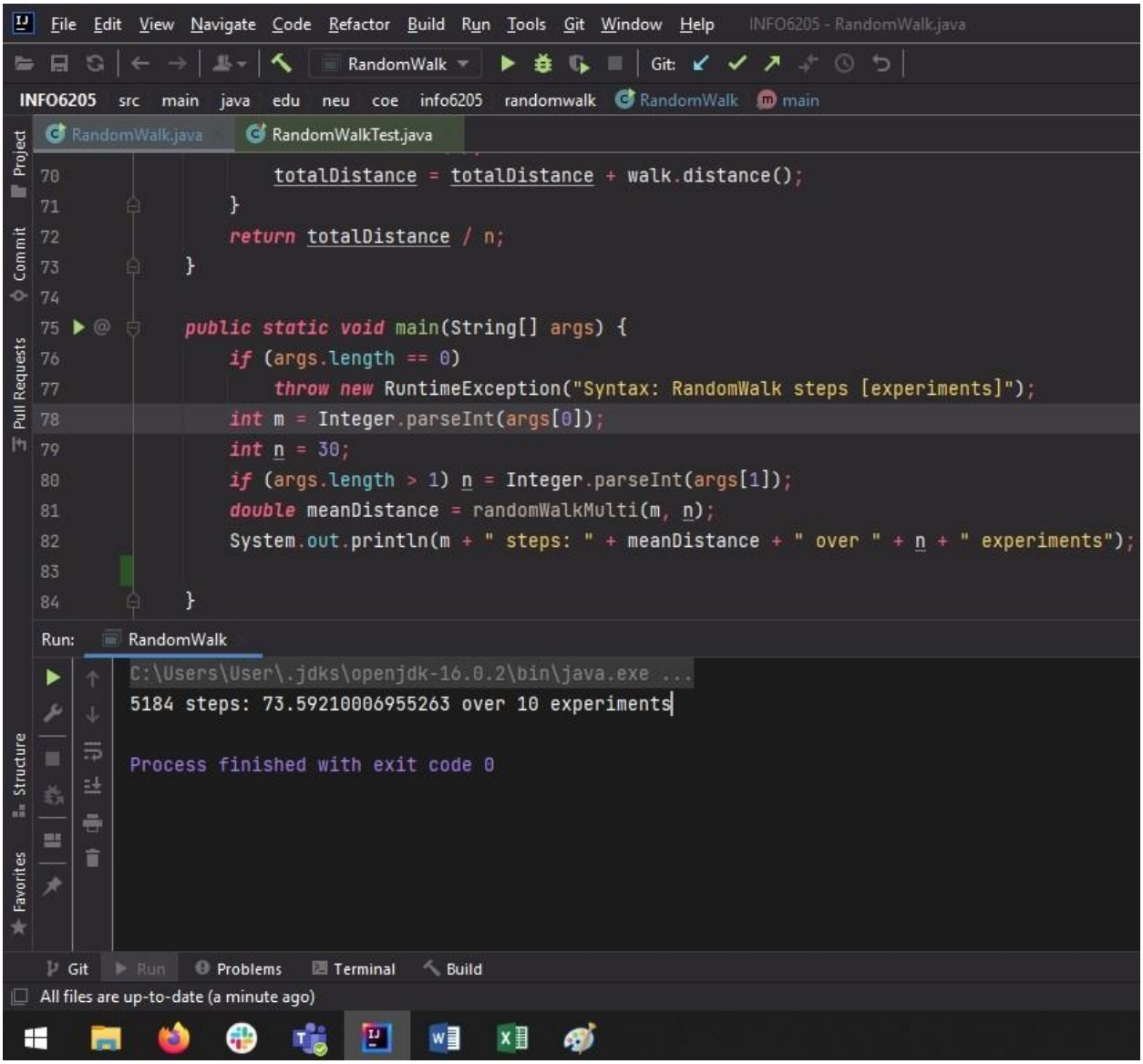
RandomWalkTest.java
totalDistance = totalDistance + walk.distance();
}
return totalDistance / n;
}
public static void main(String[] args) {
if (args.length == 0)
throw new RuntimeException("Syntax: RandomWalk steps [experiments]");
int m = Integer.parseInt(args[0]);
int n = 30;
if (args.length > 1) n = Integer.parseInt(args[1]);
double meanDistance = randomWalkMulti(m, n);
System.out.println(m + " steps: " + meanDistance + " over " + n + " experiments");
}
Run: RandomWalk
C:\Users\User\.jdks\openjdk-16.0.2\bin\java.exe ...
1296 steps: 36.796997288988905 over 10 experiments
Process finished with exit code 0
Project
Commit
Pull Requests
Structure
Favorites
Git
Run
Problems
Terminal
Build
All files are up-to-date (a minute ago)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}
return totalDistance / n;
}
public static void main(String[] args) {
if (args.length == 0)
throw new RuntimeException("Syntax: RandomWalk steps [experiments]");
int m = Integer.parseInt(args[0]);
int n = 30;
if (args.length > 1) n = Integer.parseInt(args[1]);
double meanDistance = randomWalkMulti(m, n);
System.out.println(m + " steps: " + meanDistance + " over " + n + " experiments");
}
Run: RandomWalk
C:\Users\User\.jdks\openjdk-16.0.2\bin\java.exe ...
5184 steps: 73.59210006955263 over 10 experiments
Process finished with exit code 0
Git Run Problems Terminal Build
All files are up-to-date (a minute ago)

3) **Code for RandomWalk.java:**

```
package edu.neu.coe.info6205.randomwalk;

import java.util.Random;

public class RandomWalk {

    private int x = 0;
    private int y = 0;

    private final Random random = new Random();

    /**
     * Private method to move the current position, that's to say the
drunkard moves
     *
     * @param dx the distance he moves in the x direction
     * @param dy the distance he moves in the y direction
     */
    private void move(int dx, int dy) {
        x = x + dx;
        y = y + dy;
    }

    /**
     * Perform a random walk of m steps
     *
     * @param m the number of steps the drunkard takes
     */
    private void randomWalk(int m) {
       for(int i=0; i<m; i++) {
           randomMove();
       }
    }

    /**
     * Private method to generate a random move according to the rules
of the situation.
     * That's to say, moves can be (+-1, 0) or (0, +-1).
     */
    private void randomMove() {
        boolean ns = random.nextBoolean();
        int step = random.nextBoolean() ? 1 : -1;
        move(ns ? step : 0, ns ? 0 : step);
    }

    /**
     * Method to compute the distance from the origin (the lamp-post
where the drunkard starts) to his current position.
     *
     * @return the (Euclidean) distance from the origin to the current
position.
     */
    public double distance() {
        double dist = Math.sqrt((y*y)+(x*x));
```

```
        return dist;
    }

    /**
     * Perform multiple random walk experiments, returning the mean
distance.
     *
     * @param m the number of steps for each experiment
     * @param n the number of experiments to run
     * @return the mean distance
     */
    public static double randomWalkMulti(int m, int n) {
        double totalDistance = 0;
        for (int i = 0; i < n; i++) {
            RandomWalk walk = new RandomWalk();
            walk.randomWalk(m);
            totalDistance = totalDistance + walk.distance();
        }
        return totalDistance / n;
    }

    public static void main(String[] args) {
        if (args.length == 0)
            throw new RuntimeException("Syntax: RandomWalk steps
[experiments]");
        int m = Integer.parseInt(args[0]);
        int n = 30;
        if (args.length > 1) n = Integer.parseInt(args[1]);
        double meanDistance = randomWalkMulti(m, n);
        System.out.println(m + " steps: " + meanDistance + " over " + n
+ " experiments");

    }

}
```

4) Screenshot of all unit tests passing: