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Program Structures & Algorithms

Fall

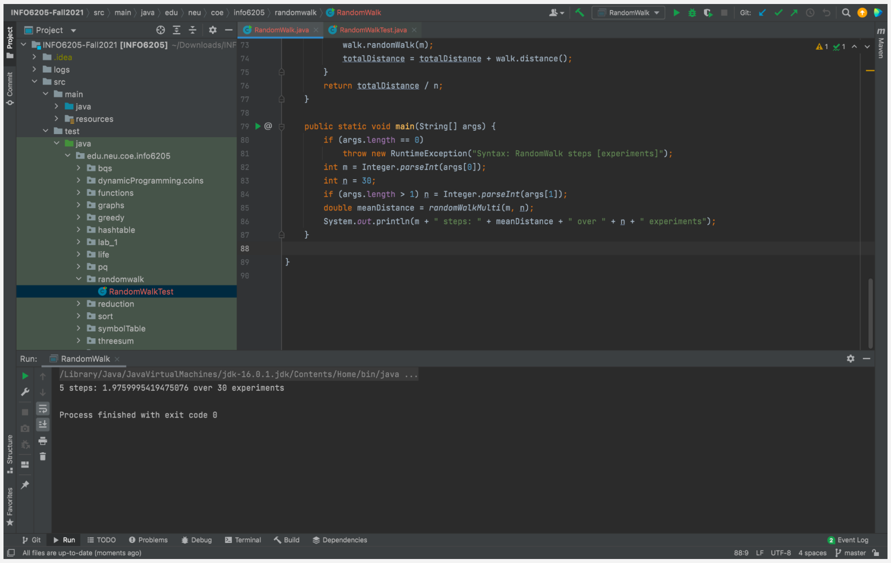
2021

Assignment No. 1

- **TASKS PERFORMED**
  1. **Implemented move() function**
  2. **Implemented randomWalk() function**
  3. **Implemented distance() function**
  4. **Tried 10 different values of N , to get various distances.**
  5. **Plotted a graph to derive a relation between d and n.**
- **Relationship Conclusion → d=sqrt(n)**
- **Evidence to support the conclusion**

1.Code output

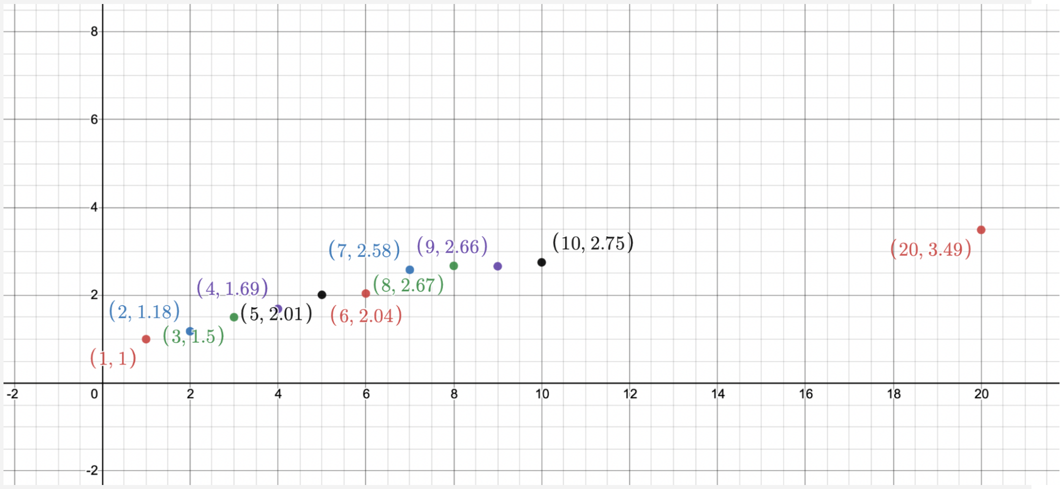
```
private void move(int dx, int dy) {
   // TO BE IMPLEMENTED
   x += dx;
   y += dy;
}


private void randomWalk(int m) {
  for(int i = 0; i < m ; i++){
      randomMove();
  }
}
public double distance() {
    double dis = Math.pow(x , 2) + Math.pow(y , 2);
    dis = Math.sqrt(dis);
    return dis;
}
```

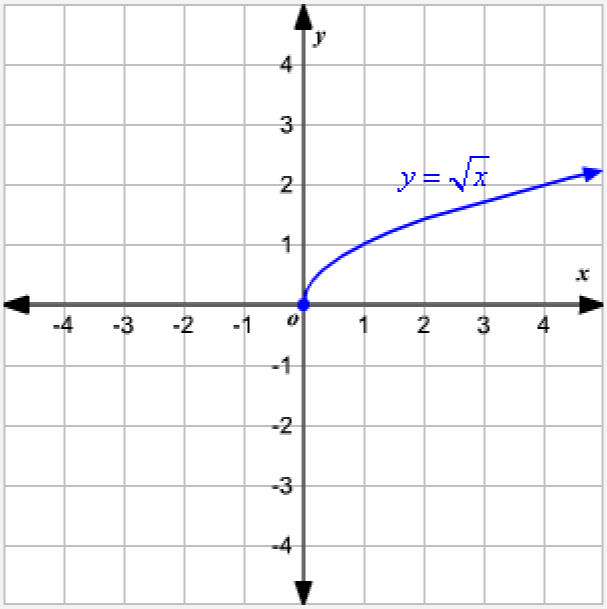


```
            walk.randomWalk(m);
            totalDistance = totalDistance + walk.distance();
        }
        return totalDistance / n;
    }

    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");
    }

}
```

```
/Library/Java/JavaVirtualMachines/jdk-16.0.1.jdk/Contents/Home/bin/java ...
5 steps: 1.9759995419475076 over 30 experiments

Process finished with exit code 0
```

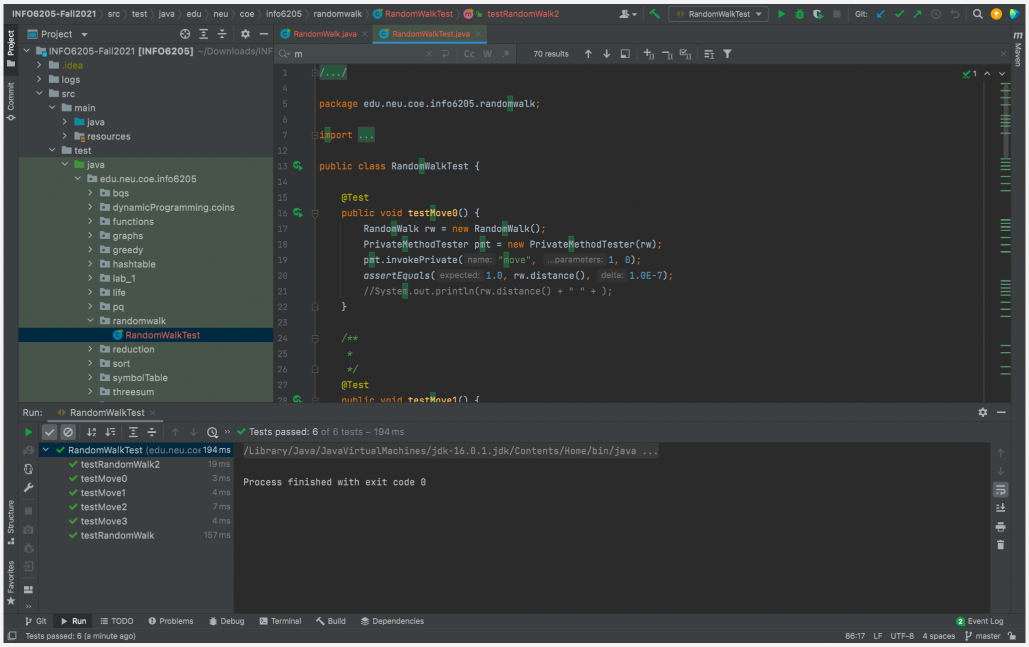
2.GRAPHICAL REPRESENTATION





The above graph looks similar to the graph of a square root function

3.UNIT TEST CASES



```
/.../

package edu.neu.coe.info6205.randomwalk;

import ...

public class RandomWalkTest {

    @Test
    public void testMove0() {
        RandomWalk rw = new RandomWalk();
        PrivateMethodTester pmt = new PrivateMethodTester(rw);
        pmt.invokePrivate("move", 1, 0);
        assertEquals(1.0, rw.distance(), 1.0E-7);
        //System.out.println(rw.distance() + " " + );
    }

    /**
     *
     */
    @Test
    public void testMove1() {
```

Tests passed: 6 of 6 tests – 194 ms

```
RandomWalkTest (edu.neu.coe   194 ms
  testRandomWalk2              19 ms
  testMove0                     3 ms
  testMove1                     4 ms
  testMove2                     7 ms
  testMove3                     4 ms
  testRandomWalk              157 ms
```

```
/Library/Java/JavaVirtualMachines/jdk-16.0.1.jdk/Contents/Home/bin/java ...

Process finished with exit code 0
```

Tests passed: 6 (a minute ago)