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## Program Structures & Algorithms

Fall 2021

### Assignment No. 3

#### Task

- Implement height-weighted Quick Union with Path Compression and Pass Unite Test
- Implement UF\_HWQUPC to run Experiment
- Determine the relationship between the number of objects (n) and the number of pairs (m) generated to accomplish this

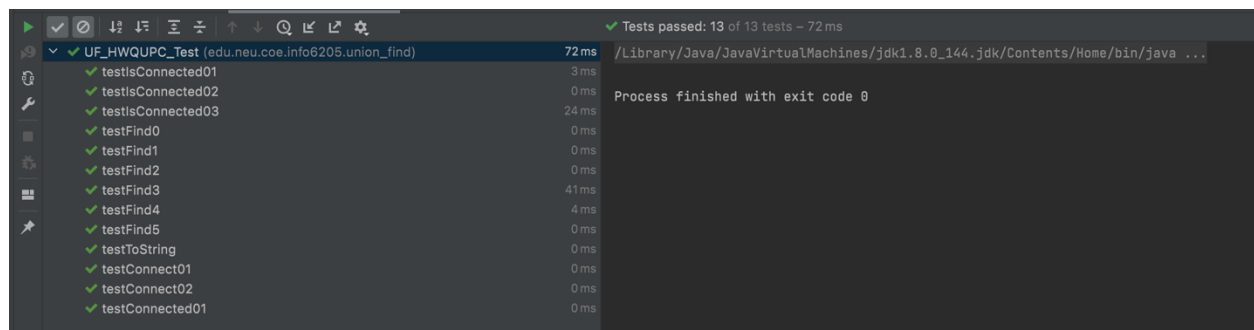
#### Relationship Conclusion:

$$m = kn + b$$

Where k is the slope and b is the bias

#### ● Output (Snapshot of Code output in the terminal)

##### ■ Part 1 Unit Test



Test Name	Duration
testIsConnected01	3 ms
testIsConnected02	0 ms
testIsConnected03	24 ms
testFind0	0 ms
testFind1	0 ms
testFind2	0 ms
testFind3	41 ms
testFind4	4 ms
testFind5	0 ms
testToString	0 ms
testConnect01	0 ms
testConnect02	0 ms
testConnected01	0 ms

##### ■ Part 2 main method output

```
/Library/Java/JavaVirtualMachines/jdk1.8.0_144.jdk/Contents/Home/bin/java ...  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 0.0  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 1.79  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 3.89  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 5.03  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 7.27  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 9.3  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 10.66  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 12.49  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 14.76  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 16.04  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 18.29  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 20.04  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 23.33  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 26.25  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 26.94  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 28.29  
Experiment # of sites is: 10240, repeat time is: 100, connect times is 31.72
```

### ■ Part 3 Relation

Relation between the # of nodes and the time of union to get them connected

