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# Program Structures & Algorithms

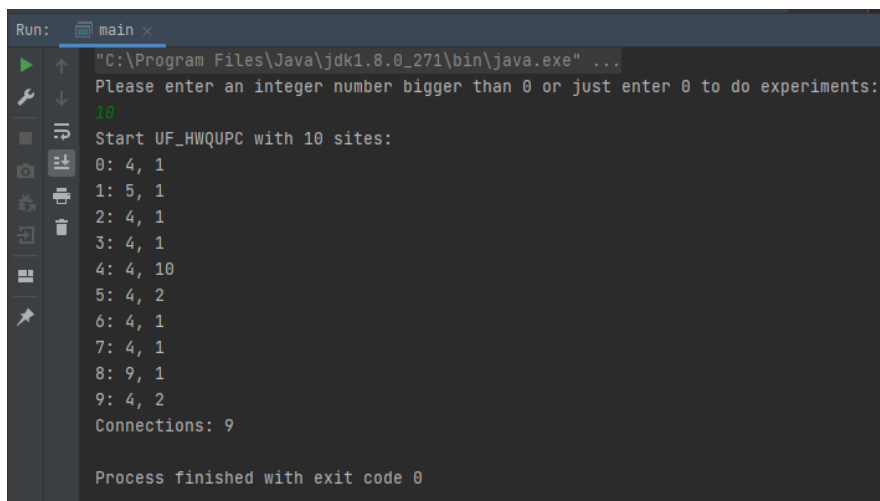
## Assignment NO.3

### 1. Task

- Implement height-weighted Quick Union with Path Compression in the class called UF\_HWQUPC.
- Develop a UF client using UF\_HWQUPC by requirements.
- Determine the relationship between the number of objects ( $n$ ) and the number of pairs ( $m$ ) from those experiments.

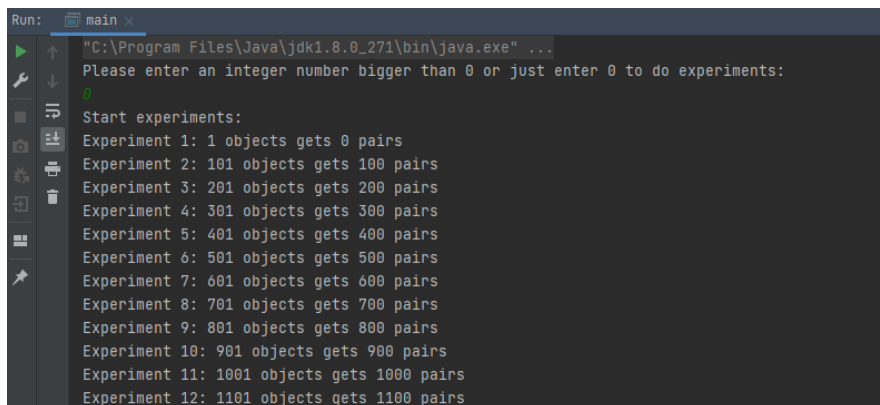
### 2. Output

- Take an integer value from command line to do a UF\_HWQUPC:



```
Run: main x
"C:\Program Files\Java\jdk1.8.0_271\bin\java.exe" ...
Please enter an integer number bigger than 0 or just enter 0 to do experiments:
10
Start UF_HWQUPC with 10 sites:
0: 4, 1
1: 5, 1
2: 4, 1
3: 4, 1
4: 4, 10
5: 4, 2
6: 4, 1
7: 4, 1
8: 9, 1
9: 4, 2
Connections: 9
Process finished with exit code 0
```

- Doing experiments ( $n$  from 1 to 10000, some are not shown in screenshot):



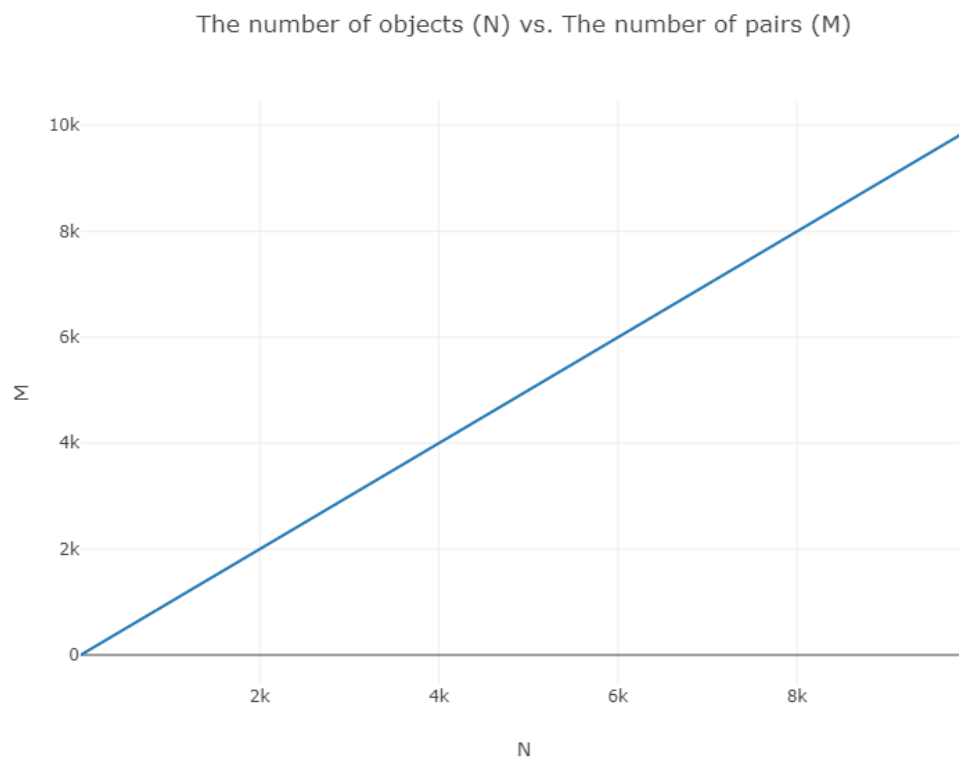
```
Run: main x
"C:\Program Files\Java\jdk1.8.0_271\bin\java.exe" ...
Please enter an integer number bigger than 0 or just enter 0 to do experiments:
0
Start experiments:
Experiment 1: 1 objects gets 0 pairs
Experiment 2: 101 objects gets 100 pairs
Experiment 3: 201 objects gets 200 pairs
Experiment 4: 301 objects gets 300 pairs
Experiment 5: 401 objects gets 400 pairs
Experiment 6: 501 objects gets 500 pairs
Experiment 7: 601 objects gets 600 pairs
Experiment 8: 701 objects gets 700 pairs
Experiment 9: 801 objects gets 800 pairs
Experiment 10: 901 objects gets 900 pairs
Experiment 11: 1001 objects gets 1000 pairs
Experiment 12: 1101 objects gets 1100 pairs
```

### 3. Relationship Conclusion

$$N = M - 1$$

### 4. Evidence to support the conclusion:

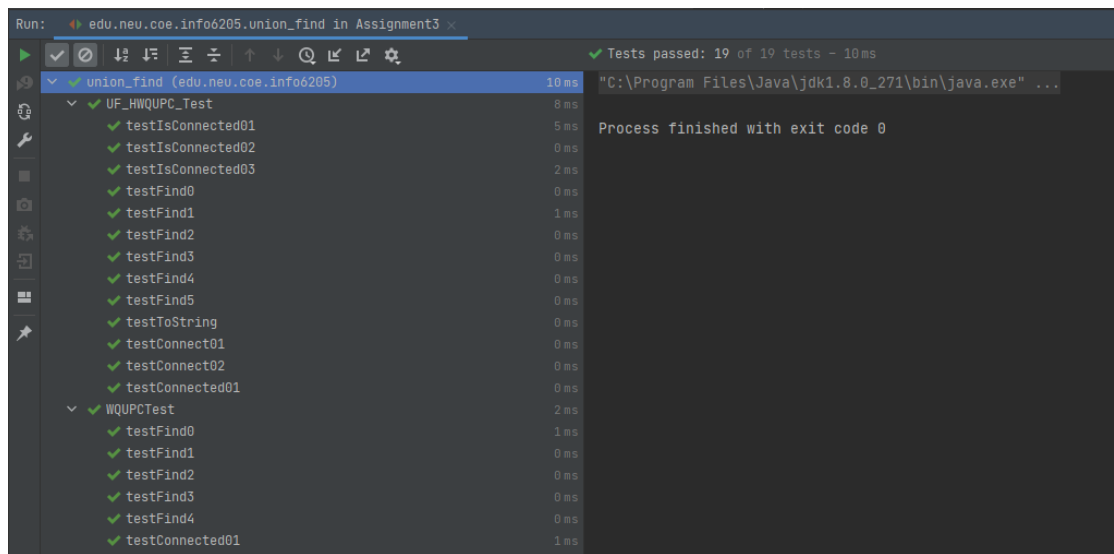
- Chart



- Table (full version is under zip file named **Results**)

N	M
1	0
101	100
201	200
301	300
401	400
501	500
601	600
701	700

## 5. Unit test results



## 6. Code

The project of this assignment is called **Assignment3** in the zip file.