Program Structures & Algorithms

Spring 2022

Assignment No. 3

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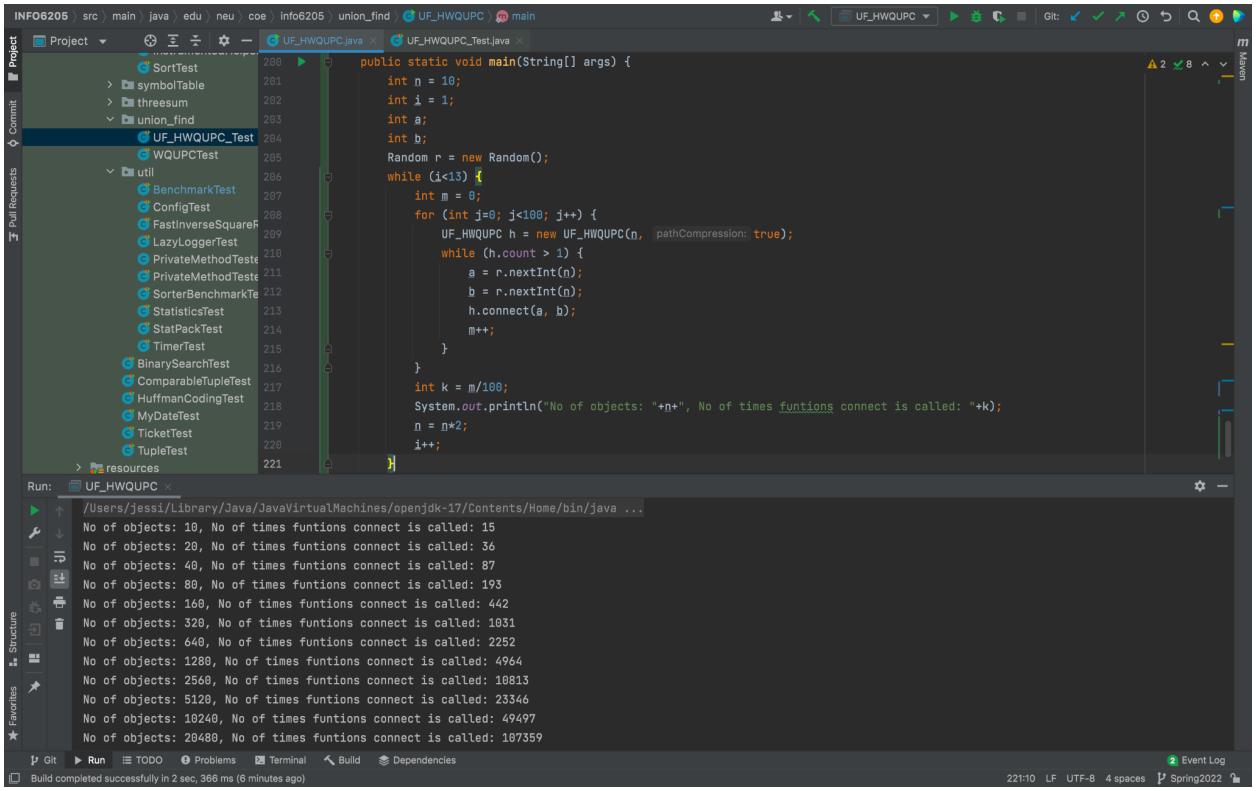
Task:

1) (a) Implement height-weighted Quick Union with Path Compression.
(b) Check that the unit tests for this class all work.
2) Create a main program that takes n from the command line, calls count() and prints the returned value.
3) Determine the relationship between the number of objects (*n*) and the number of pairs (*m*)

Output screenshot:



Conclusion:

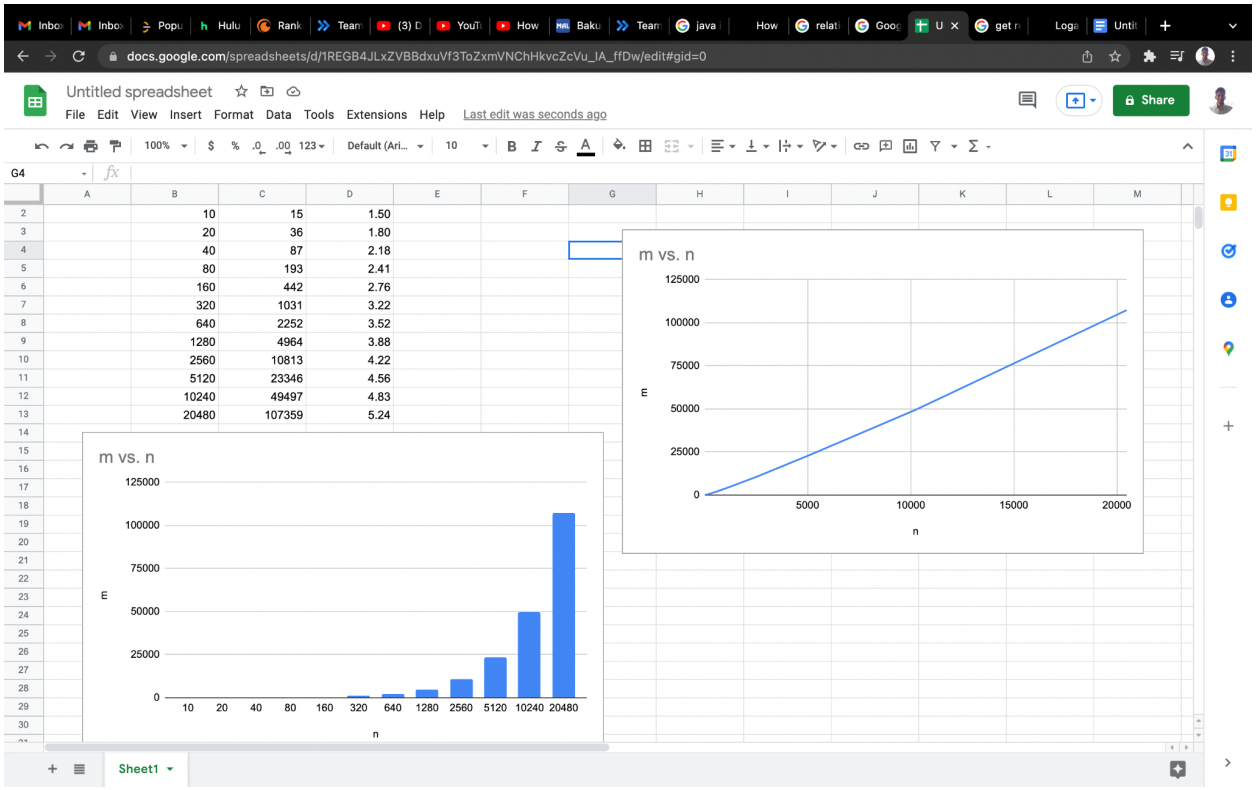
As the number of objects(n) are increasing the number of pairs(m) increasing in n times the logarithm of n with base approximately 5.

$$m = n * log_5(n)$$

For larger values of n which is around 5000 to 20000, m value is nearly 5 times of n which can be seen in the evidence graph.

$$m = 5n$$

Evidence / Graph:



n	m	m/n
10	15	1.50
20	36	1.80
40	87	2.18
80	193	2.41
160	442	2.76
320	1031	3.22
640	2252	3.52
1280	4964	3.88
2560	10813	4.22
5120	23346	4.56
10240	49497	4.83
20480	107359	5.24

Unit tests result

Part 1: