

# Program Structures & Algorithms

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## Assignment No. 3

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- **Task**

Implement the codes and determine the relationship between the number of objects ( $n$ ) and the number of pairs ( $m$ ).

- **Relationship Conclusion**

$m \propto n$ .  $m$  is proportional to  $n$

- **Evidence / Graph**

I pick 50 different values of  $n$  randomly from 0 to 500. For each  $n$ , I run the count() function 100 times and take the average number of operations. It seems that  $m$  is proportional to  $n$  in the scatter plot.

<b>n</b>	18	34	36	55	67	78	80	101	156	169
<b>m</b>	11	22	23	35	42	49	51	64	99	107

<b>n</b>	192	195	199	215	217	223	224	229	232	260
<b>m</b>	122	125	135	137	140	142	145	147	165	170

<b>n</b>	268	294	299	300	305	306	309	312	316	329
<b>m</b>	170	186	189	190	193	195	196	198	201	207



- Unit tests result

The screenshot shows an IDE with the following components:

- Project Explorer:** Displays the project structure under 'edu.neu.coe.info6205'. The 'union\_find' directory is expanded, showing 'UF\_HWQUPC\_Test' as the selected test class.
- Code Editor:** Shows the source code of 'UF\_HWQUPC\_Test.java'. The code includes package declarations, imports, and a single test method 'testToString()' that creates a 'Connections' object and asserts its string representation.
- Run Console:** Displays the execution results of the tests. It shows 'Tests passed: 13 of 13 tests - 15 ms'. A detailed list of tests follows, all marked with green checkmarks and their execution times.

Test Name	Duration
testIsConnected01	9 ms
testIsConnected02	1 ms
testIsConnected03	4 ms
testFind0	0 ms
testFind1	0 ms
testFind2	0 ms
testFind3	0 ms
testFind4	0 ms
testFind5	0 ms
testToString	1 ms
testConnect01	0 ms
testConnect02	0 ms
testConnected01	0 ms

Process finished with exit code 0