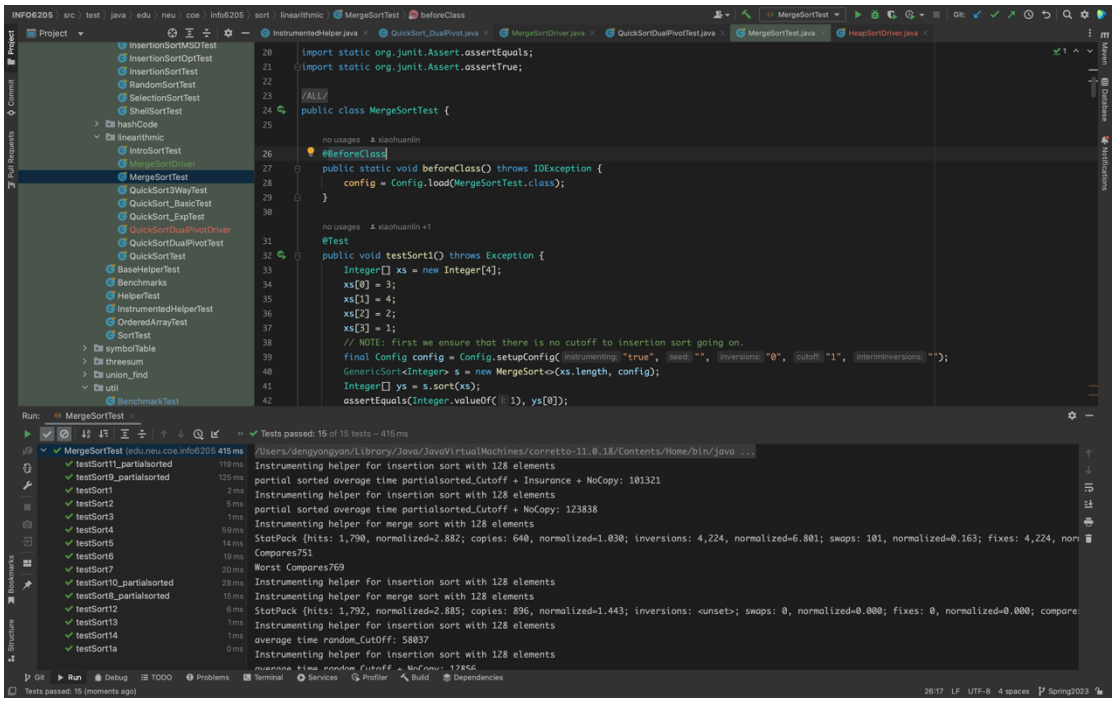
INFO6205 - Sort Algorithm Time and Instruments

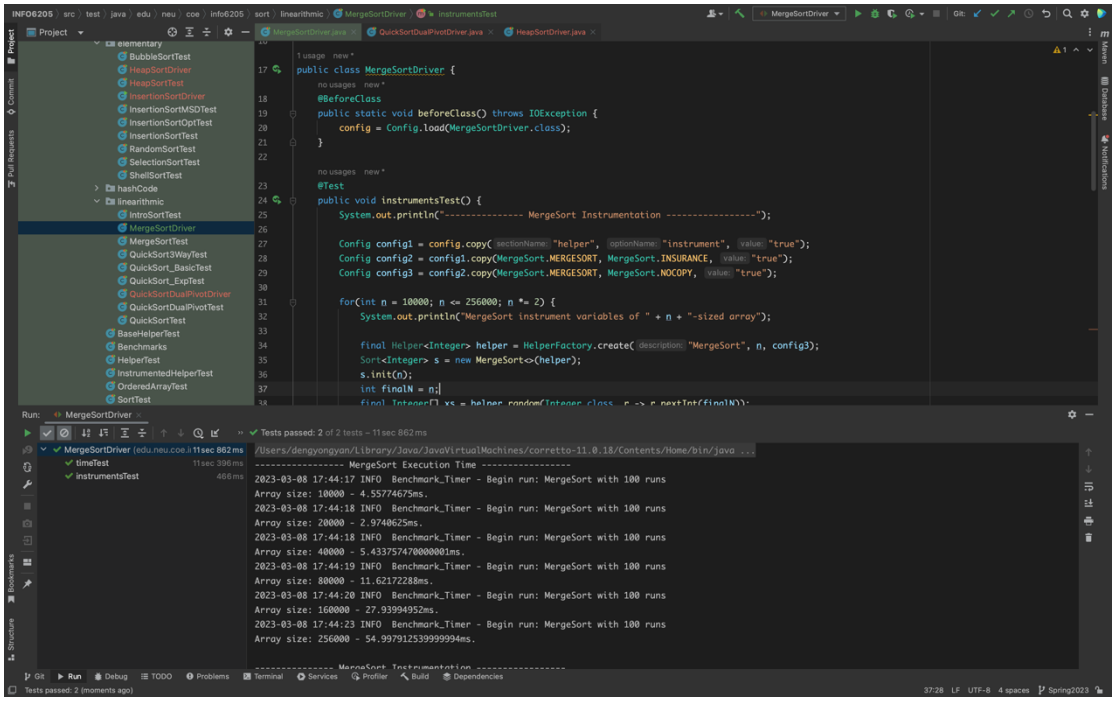
In this assignment, I will create some drivers to discover the relationship between instruments like Compares, Swaps/Copies, Inversions, and Execution time.

Here is the screenshot of “MergeSortTest.java”



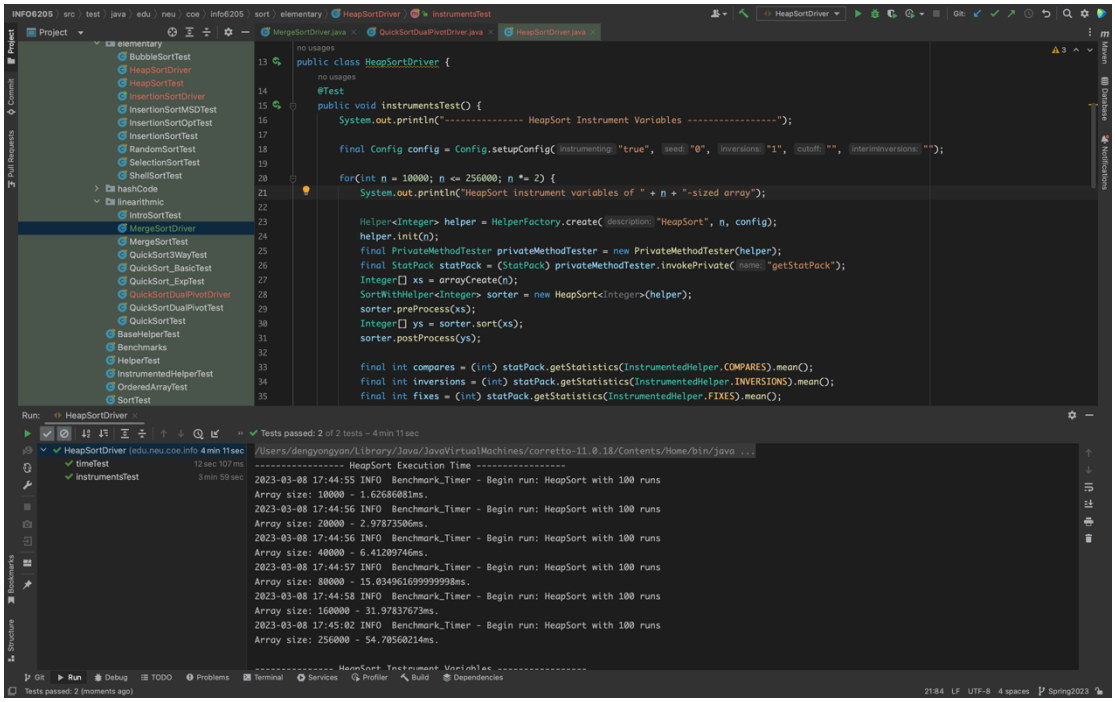
I created 3 drivers for MergeSort, HeapSort and QuickSort Dual Pivots to get the number of execution time and instruments. All drivers are store in “src/test/java/edu/neu/coe/info6205/sort/”.

Here is the screenshot of “MergeSortDriver.java”.



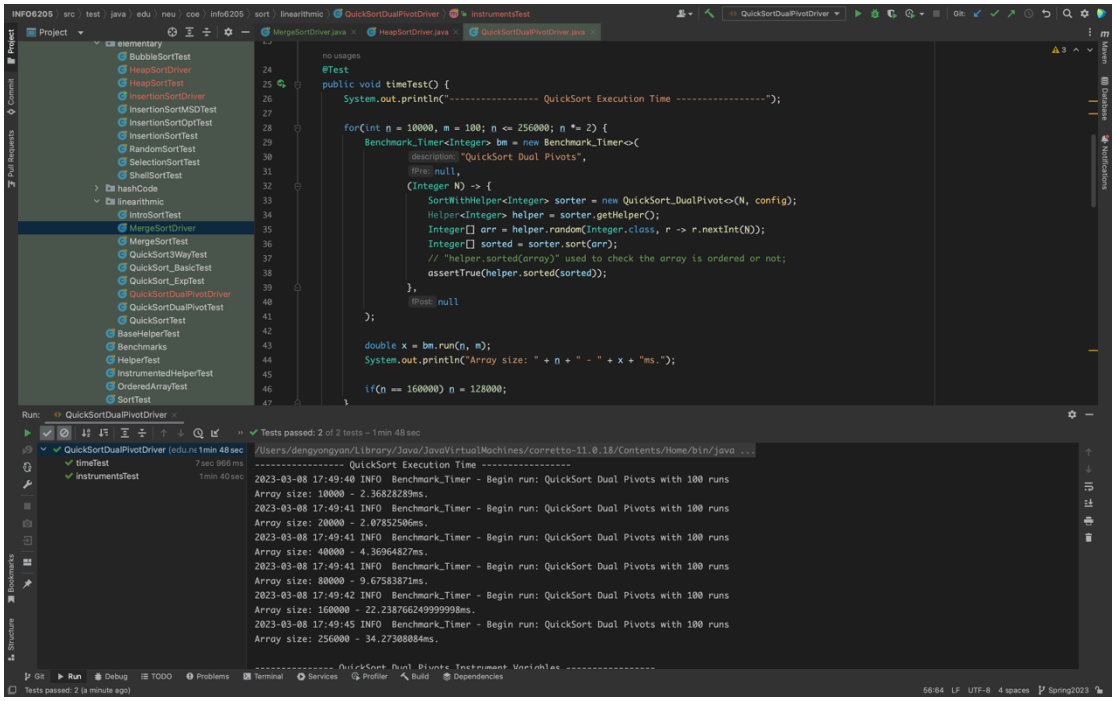
(src/test/java/edu/neu/coe/info6205/sort/linearithmic/MergeSortDriver.java)

Here is the screenshot of “HeapSortDriver.java”



(src/test/java/edu/neu/coe/info6205/sort/elementary/HeapSortDriver.java)

Here is the screenshot of “QuickSortDualPivotsDriver.java”



(src/test/java/edu/neu/coe/info6205/sort/linearithmic/QuickSortDualPivotDriver.java)

With these drivers, we can get the data about execution time and number of different instruments.

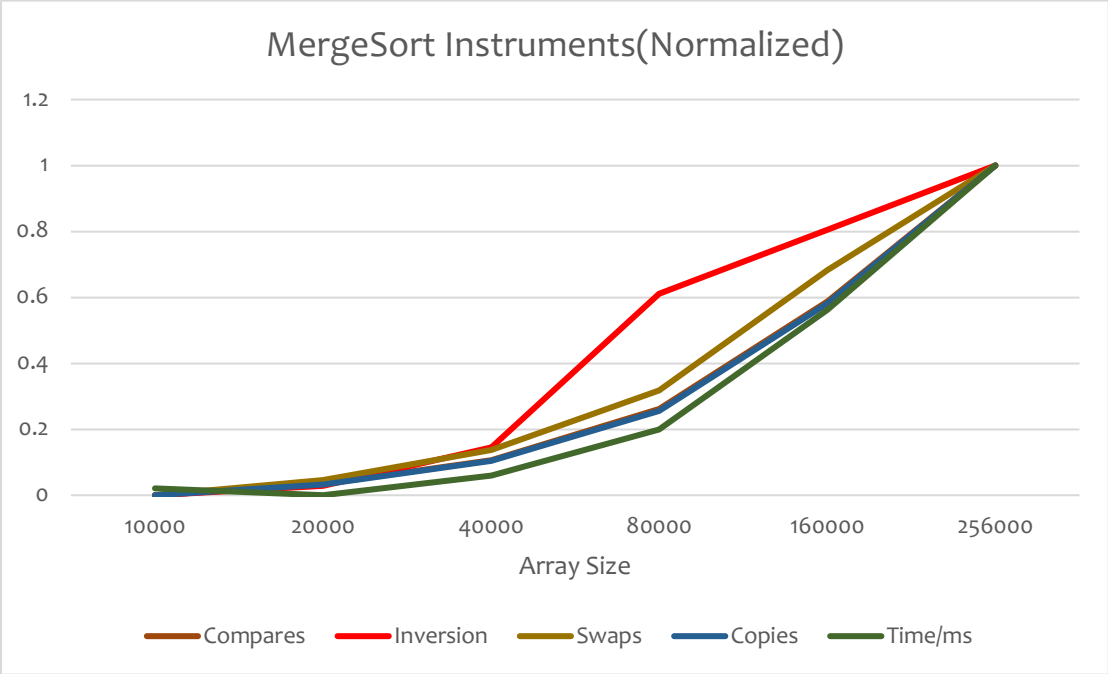
MergeSort					
Size	Compares	Inversions	Swaps	Copies	Time/ms
10000	123561	24905797	9807	109942	3.69917165
20000	267211	99814902	19562	239912	2.74883333
40000	573986	399884459	39231	519817	5.43663459
80000	1228013	1597155228	78016	1119565	11.60084536
160000	2616557	2097953446	156226	2399266	27.79857249
256000	4361038	2600000000	224070	4049912	47.29149669

HeapSort					
Size	Compares	Inversions	Swaps	Copies	Time/ms
10000	235502	25137166	124349	0	1.4379617
20000	510812	100113321	268480	0	3.07158838
40000	1101105	400315862	576605	0	6.44107251
80000	2362754	1608166123	1233241	0	14.1264979
160000	5045744	2097934506	2627385	0	31.98909374
256000	8411045	2400000000	4372370	0	55.38631043

QuickSort Dual Pivots					
Size	Compares	Inversions	Swaps	Copies	Time/ms
10000	151787	24835299	62014	0	2.78224168
20000	338489	99832908	143257	0	2.02734504
40000	712249	399394145	312090	0	4.36833037
80000	1534839	1600340564	626596	0	9.63244332
160000	3265825	2086294638	1377444	0	20.48452921
256000	5525002	2500000000	2190632	0	33.67086083

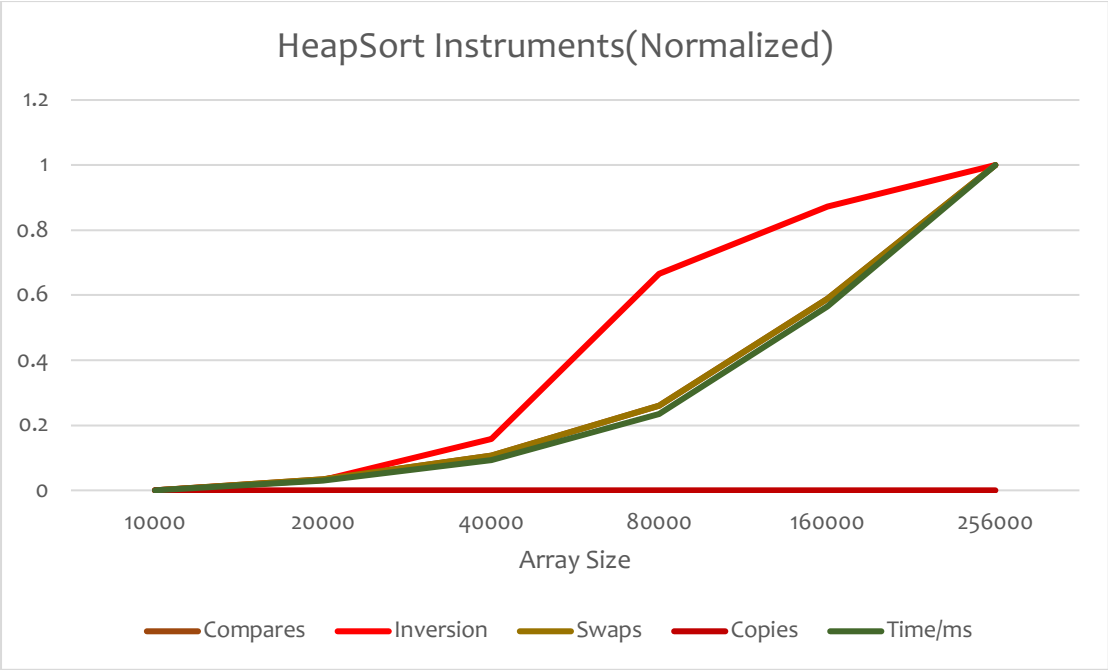
By normalizing the number and draw the graph of those data, we can get the relationship between execution time and instruments in different sort algorithm.

MergeSort:



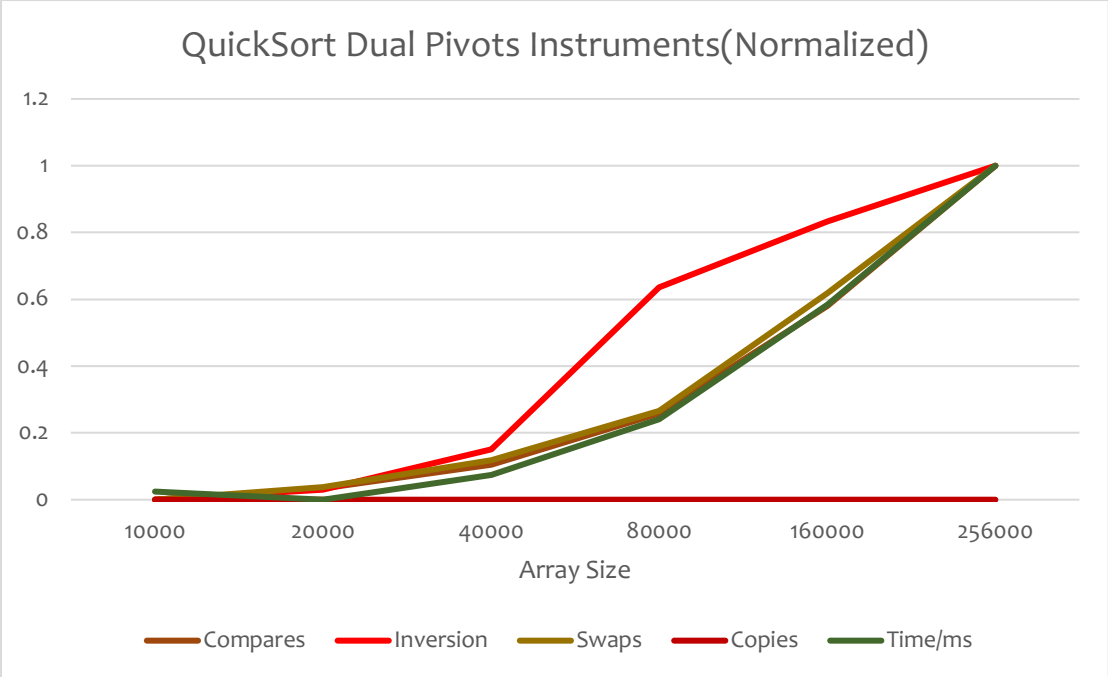
It shows that the number of Swaps/Copies fits Execution Time perfectly, which means that the number of Swaps/Copies determines the Time in MergeSort algorithm.

HeapSort:



It shows the number of Compares and Swaps determine the Execution Time in HeapSort algorithm.

QuickSort Dual Pivots



It shows that the number of Compares and Swaps determine the Execution Time in QuickSort Dual Pivots algorithm.