

## Assignment 6 Observations

By:

Amretasre Rengarajan Thiruvengadam,

NUID: 002762670

### Relationship Conclusion:

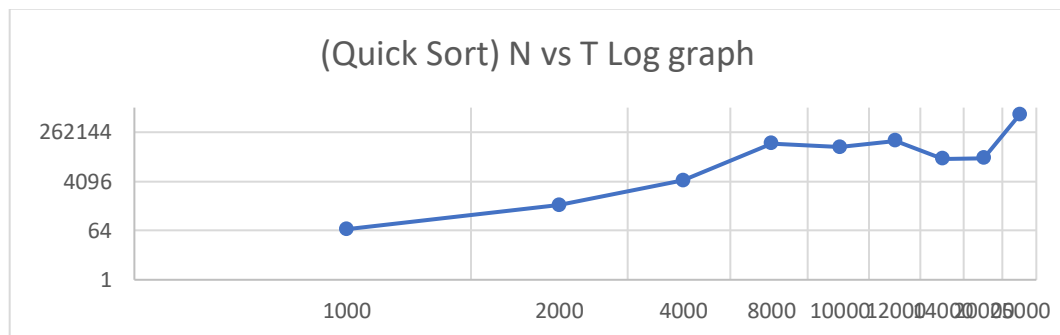
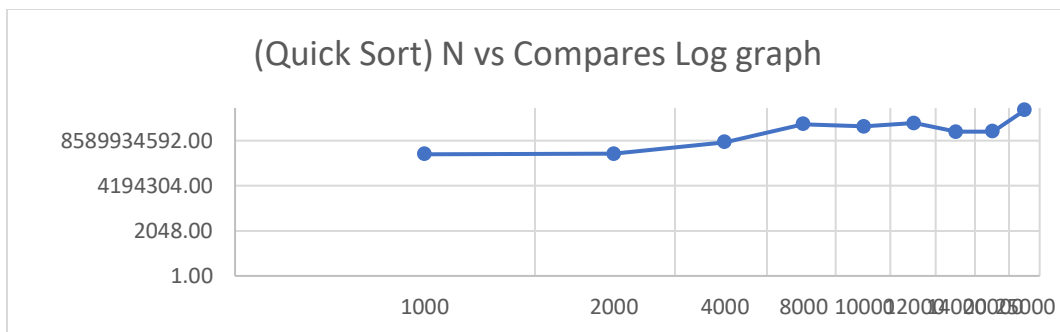
After running Merge Sort, Quick Dual Pivot sort and Heap Sort for various array lengths (N) and measuring the compares, swaps, and the execution time (T), it is evident that the number of compares is the best predictor of execution time. This can be proved by drawing Log-Log graphs for the array length (N) compared with execution time and compares.

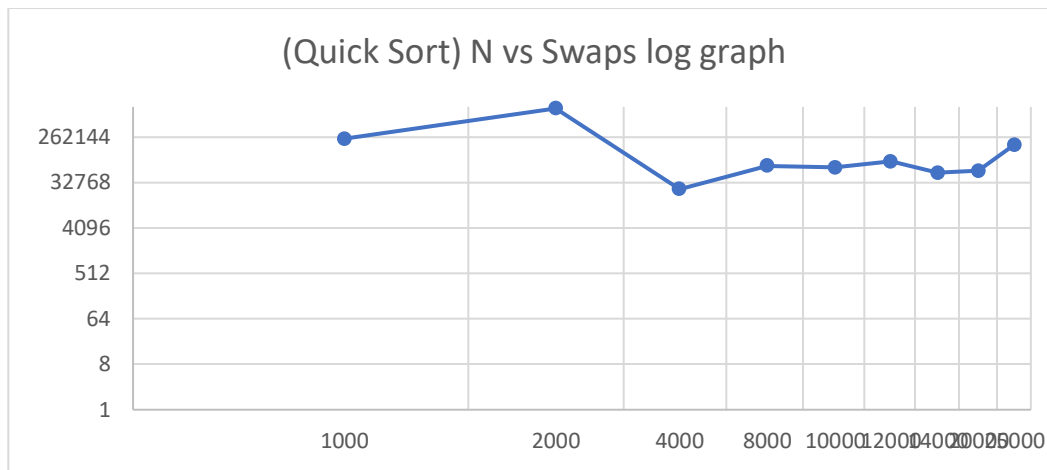
### Observations and Graphs:

1. The table below shows the observations done while running Dual Pivot Quick Sort for various array lengths.

Array size	Compares	Swaps	Time For Execution(ns)
1000	857945242.00	243344	72
2000	931956069.00	975592	548
4000	6585586876.00	24250	4427
8000	137221140946.00	70113	100111
10000	96475250905.00	65878	73633
12000	165903562203.00	86149	126123
14000	37470328866.00	51348	27564
20000	40674779015.00	55881	29557
25000	1505889806004.00	183400	1171454

Below are the graphs plotted for the above table values,

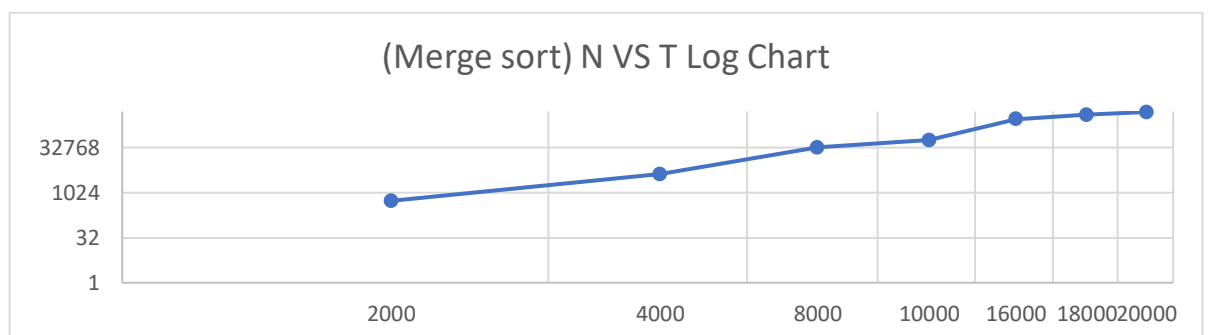
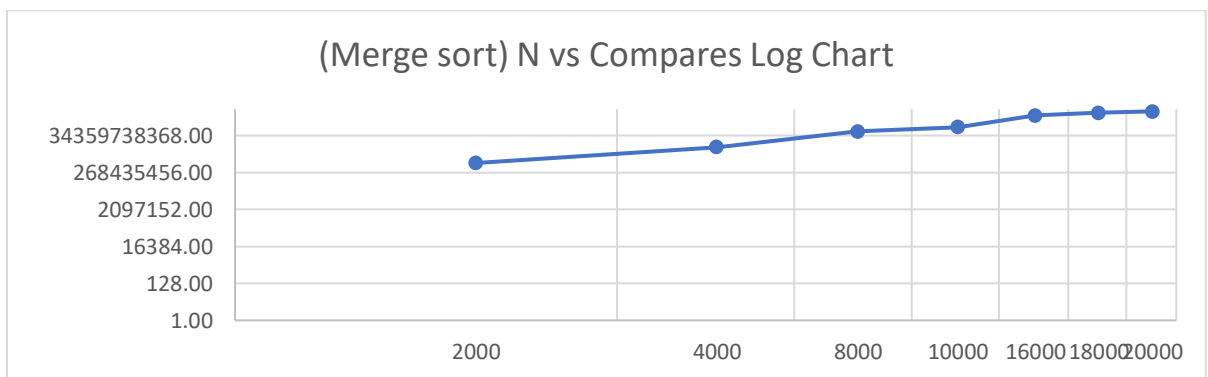


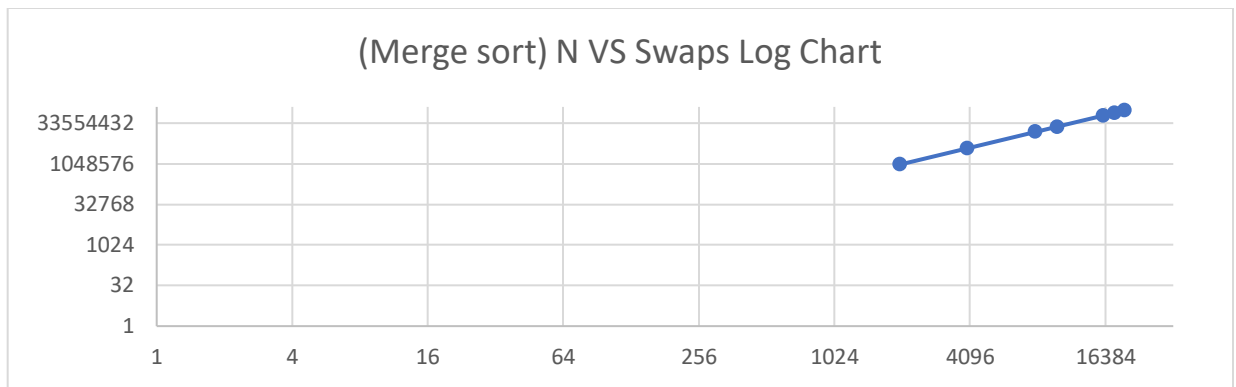


2. The below table depicts the observations done for Merge Sort for various array lengths.

Array size	Compares	Swaps	Time For Execution(ns)
2000	931956069.00	975592	545
4000	7439790141.00	3921189	4278
8000	59455080285.00	15783079	33235
10000	102401919645.00	24798866	58362
16000	475388136573.00	63765552	287952
18000	663484181829.00	80716387	404537
20000	819207709293.00	99119090	505153

Similarly, the Log-Log graph for the above value is below,

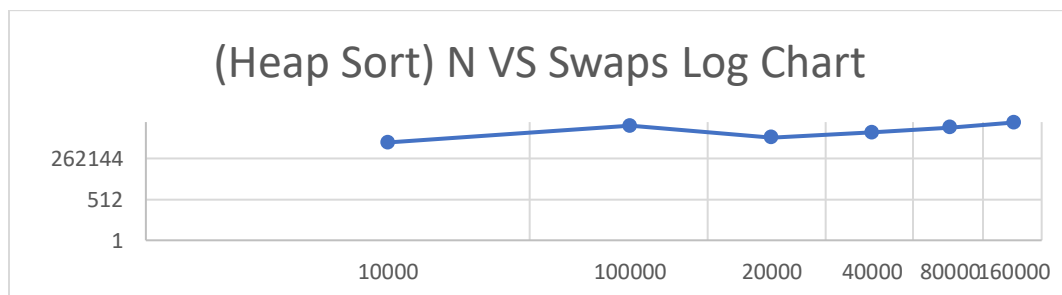
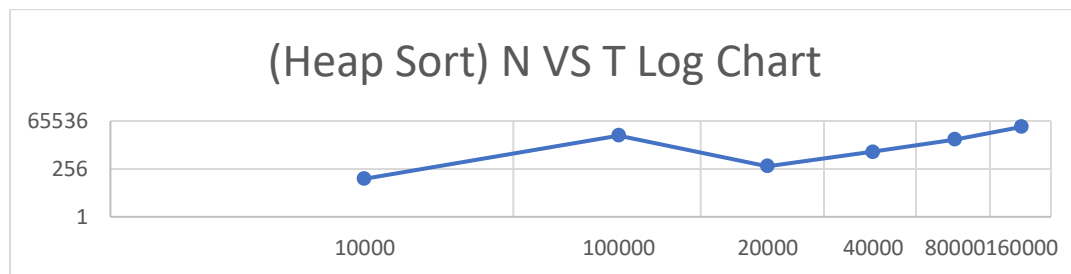
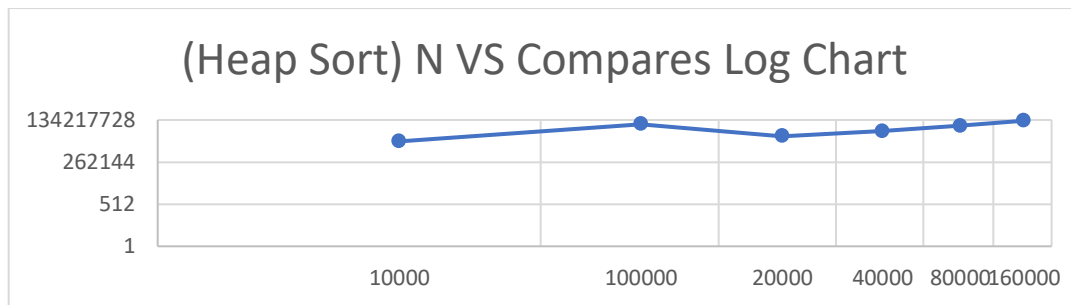




3. Finally, the table below depicts the observations done for Heap Sort,

Array Size	Compares	Swaps	Time(ns)	Runs
10000	5611727	3010268	81.95	20
100000	71542070	37852961	12394.7	20
20000	12151730	6485735	357.85	20
40000	26156587	13911666	1840.25	20
80000	56017321	29678848	7870.6	20
160000	119450455	63021366	33239.15	20

The Log-Log graph for Heap Sort observation is below,



From the Log graphs drawn between Log N vs Log T and Log N vs Log (Comparisons) it is evident that the Comparison values are almost equal to execution time (T). The graph drawn between Log N vs Log T and Log N vs Log (Swaps) is completely different for all three sorting techniques. Hence comparisons are the best predictor of execution time.