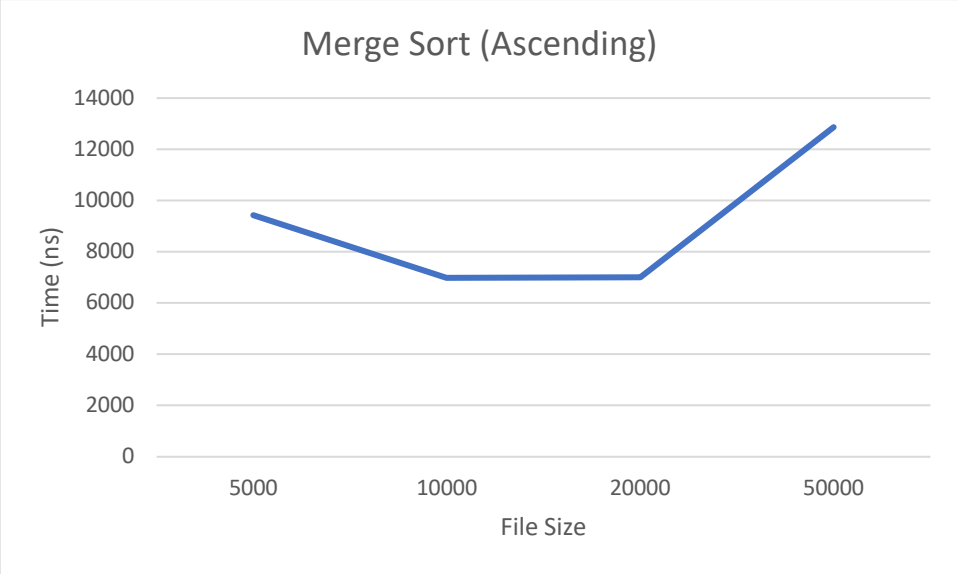
Sorting Analysis

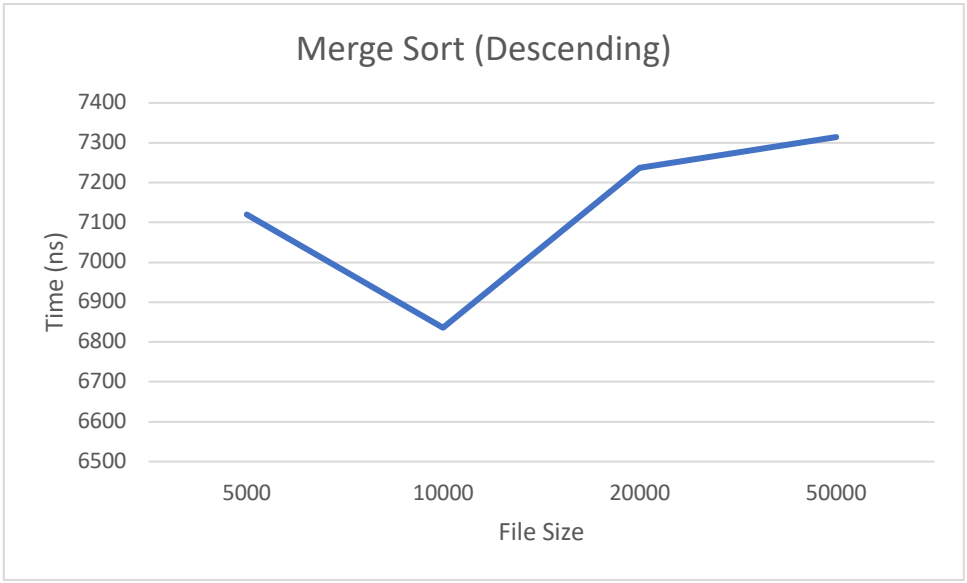
The two different sorting routines implemented are merge sort and selection sort. Merge sort has a computational complexity of O(n log(n)) and selection sort has a computational complexity of $O(n^2)$. Each case for both sorting algorithms was tested 10 times. The results of the worst case, best case and average case runtime were very interesting for each file size.

Merge Sort:



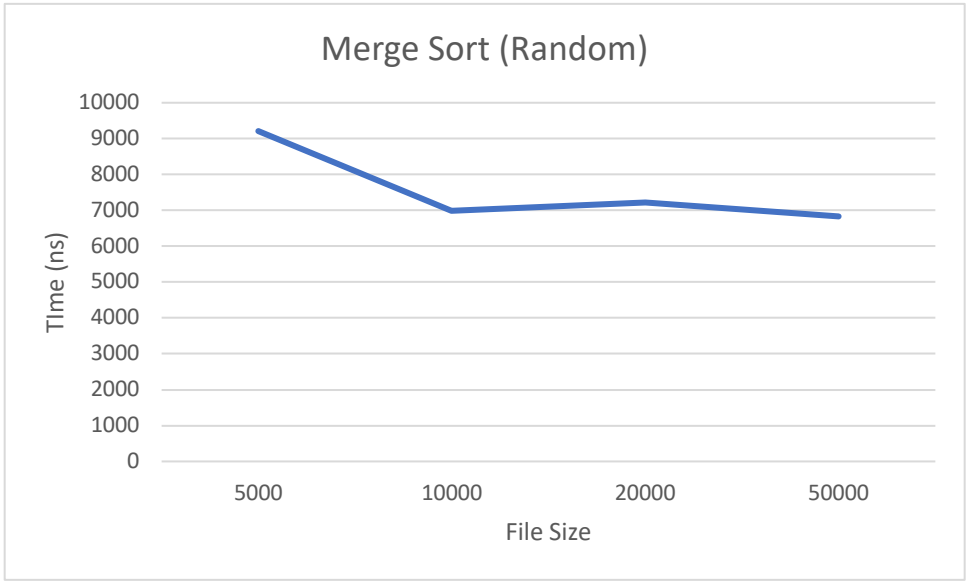
Merge Sort (Ascending)	Time (ns)
5000	9433.2
10000	6984.1
20000	7013.3
50000	12864.4

In the merge sort of ascending order, there is a slight dip in time from file with 5000 integers to 10000 integers. From 20000 to 50000, there is a significant increase in time. The file with 50000 integers had the highest time as shown in both the graph and chart and surprisingly, the file with 10000 integers had the shortest time.



Merge Sort (Descending)	Time (ns)
5000	7120.1
10000	6835.9
20000	7237.3
50000	7314.3

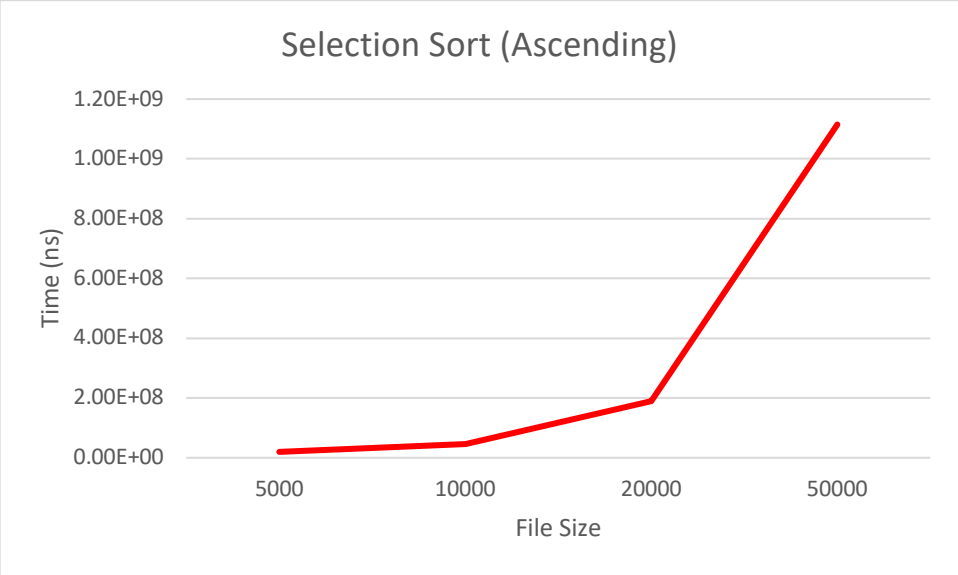
In merge sort of descending order, we again see a dip in time from the file with 5000 integers to the file with 10000 integers. From the file with 10000 integers to 50000 integers, the sorting time increases. The file with 50000 integers again took the most time and the file with 10000 integers took the least amount of time.



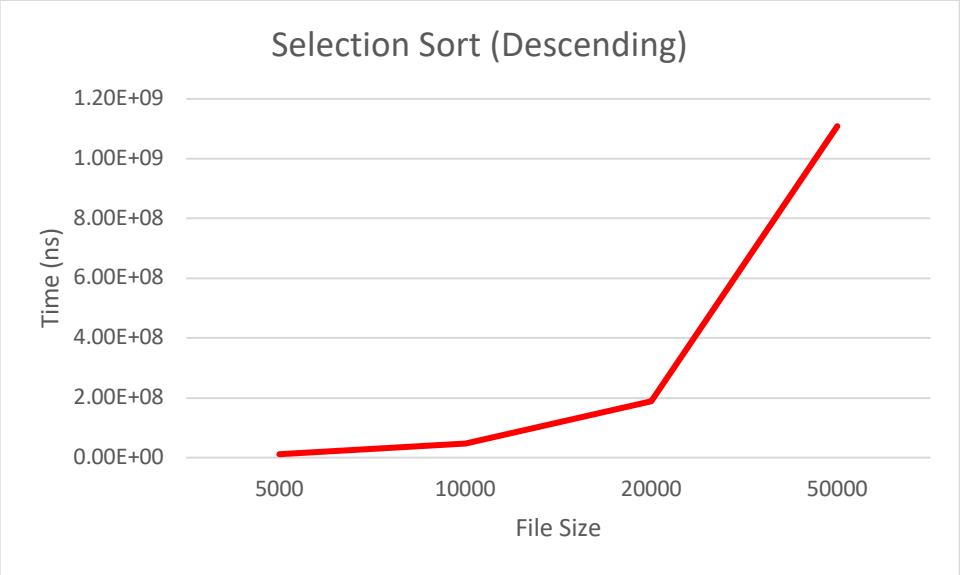
Merge Sort (Random)	Time (ns)
5000	9209.8
10000	6992
20000	7215.5
50000	6831.3

Merge sort for random order was interesting. Looking at the chart, one can see that the sorting time decreases as the file size increases. In this scenario, the file with 50000 integers had the fastest time while the longest time here was the file with 5000 integers.

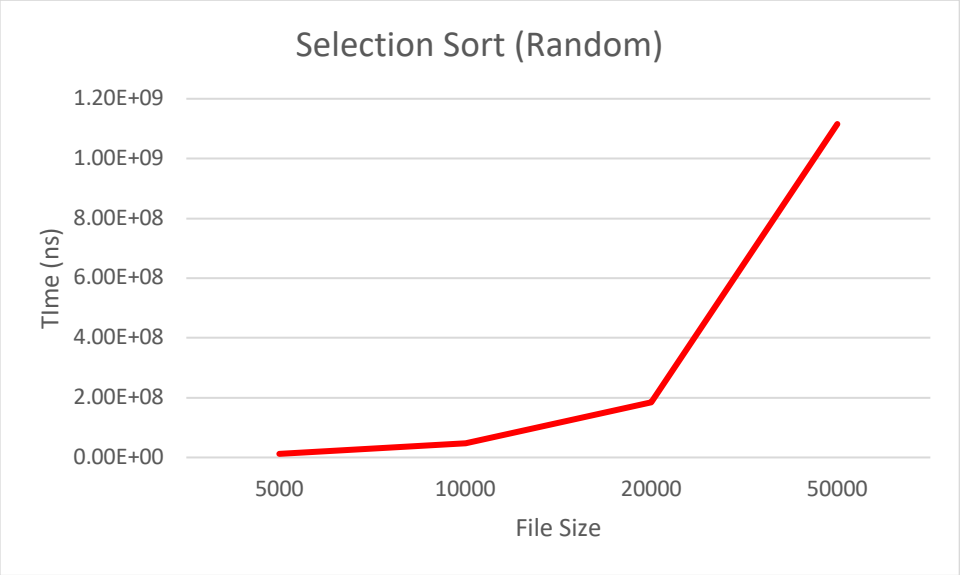
Selection Sort:



Selection Sort (Ascending)	Time (ns)
5000	1.97E+07
10000	4.69E+07
20000	1.90E+08
50000	1.11E+09



Selection Sort (Descending)	Time (ns)
5000	1.13E+07
10000	4.61E+07
20000	1.87E+08
50000	1.11E+09



Selection Sort (Random)	Time (ns)
5000	1.20E+07
10000	4.66E+07
20000	1.84E+08
50000	1.12E+09

Selection sort with ascending order, descending order and random order all have a constant increasing sort time. From the file with 20000 integers to the file with 50000 integers, there is a significant increase in sorting time. The file with 5000 integers had the shortest sorting time and the file with 50000 integers had the highest sorting time.