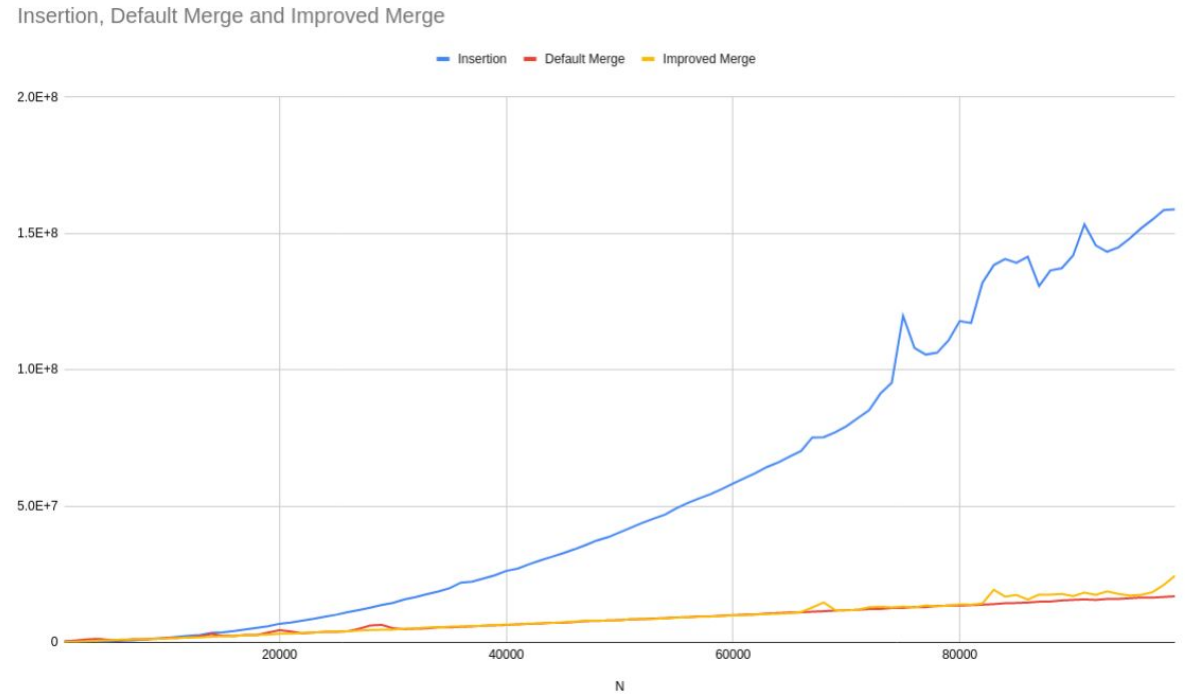
Part 3

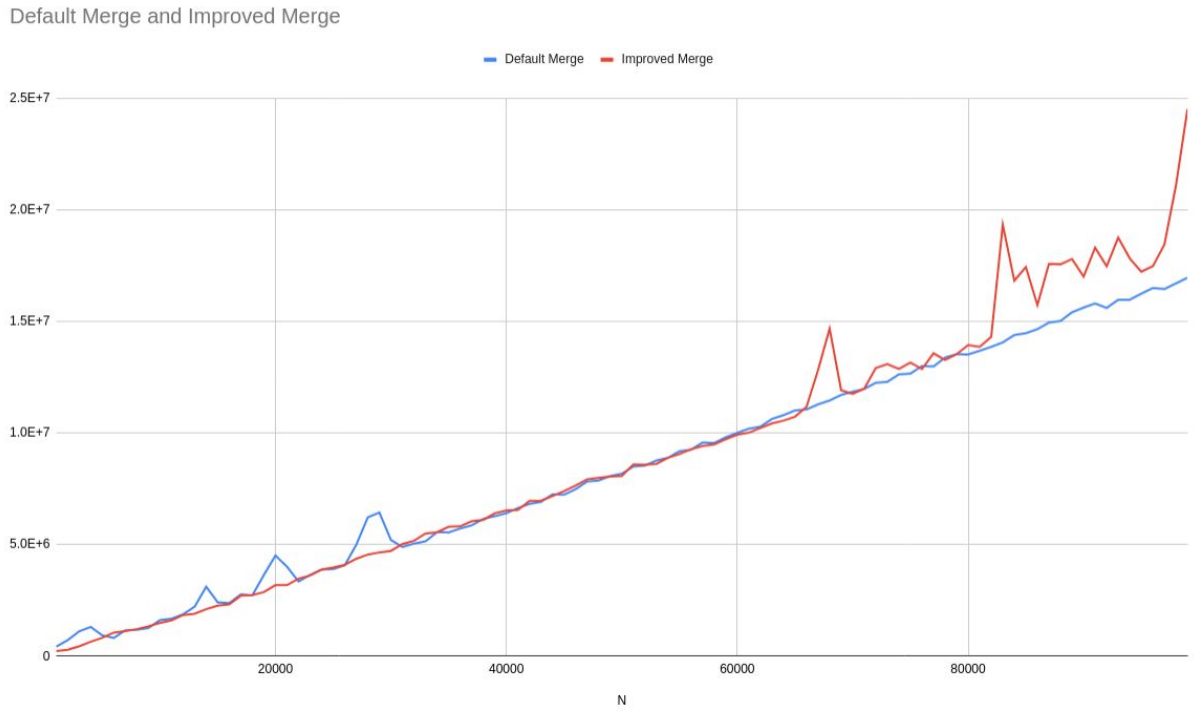
Compare the performance of Insertion Sort, MergeSort and MergeSortEnhanced on a range of inputs (N= 10, 1000, 10000, 100000 etc.).

Please find below a graph comparing insertion sort (blue) with the standard merge sort (red) and the improved merge sort (yellow)



As can be seen from the above graph, both versions of mergesort are signifacntly faster than insertion sort. This makes sense, since both versions of mergesort are O(n logn) algorithms, whereas insertion sort is an O(n^2) algorithm. This means that the **growth rate** of insertion sort is significantly higher than that of either version of mergesort.

Below, please find a graph of standard merge sort (red) and improved merge sort (yellow)



As can be seen from the above graph, the improved merge sort generally matched the standard merge sort. There are portions of the graph where the improved mergesort is faster than the standard, and other parts where the opposite is true. This isn't too surprising, as the improvements are somewhat parameterised (e.g. what exactly should the 'cut-off' point be

before deciding to sort a small sub-array with insertion sort). Experimentation would be required to find the optimal values for these parameters.