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Lab 6 Problem 3

Using Merge Sort:

Input Size	Input Time	Sorting Time	Output time	Total Time	Percent of time taken by input + output
N = 10	0.000161 s	7.3e-05 s	0.00502 s	0.005254 s	98.6%
N = 100	0.000282 s	0.000666 s	0.000705 s	0.001653 s	59.7%
N = 1,000	0.000925 s	0.007172 s	0.003985 s	0.012081 s	40.6%
N = 10,000	0.005748 s	0.055059 s	0.011744 s	0.072551 s	24.1%
N = 100,000	0.038027 s	0.589525 s	0.05858 s	0.686132 s	14.1%
N = 1,000,000	0.327428 s	6.793822 s	0.490691 s	7.611941 s	10.7%

The percent of time taken by input and output combined is decreasing every time the size of n is raised. This is because the at first, with a tiny size for n, the majority of the time spent in the function is reading the numbers in and out, since the sorting takes almost no time at all. As we reach the largest of the input sizes, the sorting takes up so much that the time reading and writing data is almost negligible.
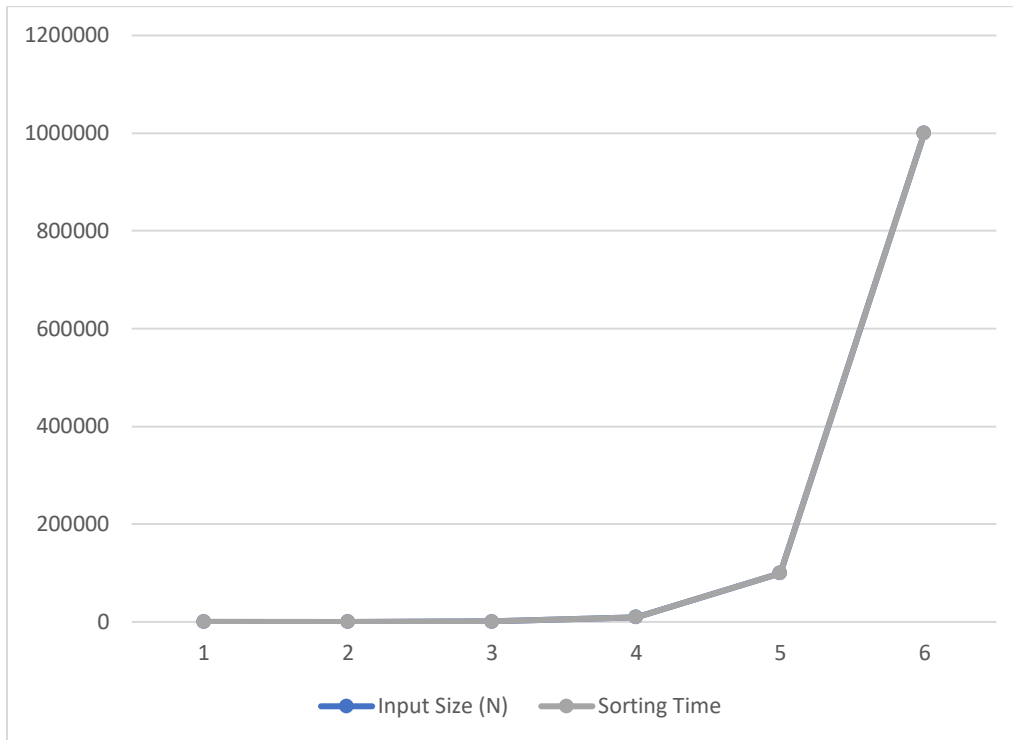
Using Selection Sort:

| Input Size	Input Time	Sort Time	Output time	Total Time	% of time taken by input + output
N = 10	0.000274 s	2.7e-05 s	0.002859 s	0.00316 s	99.1%
N = 100	0.000286 s	0.000773 s	0.000706 s	0.001765 s	56.2%
N = 1000	0.000881 s	0.040408 s	0.001438 s	0.042727 s	5%
N = 10000	0.008893 s	3.234402 s	0.010024 s	3.253319 s	.05%
N = 100000	0.03941 s	331.37393 s	0.056105 s	331.469444 s	>.00%
N = 1000000	0.347143 s	104371 s	0.347143 s	104400 s	>.00%

The decrease in the percentage of time spent reading and writing to files has the same significance with this function, but the decrease in percent with each increase of N is much more drastic than with merge sort. That doesn't have to do with reading and writing becoming somehow more efficient, but rather with the amount of time sorting being so much longer in comparison.
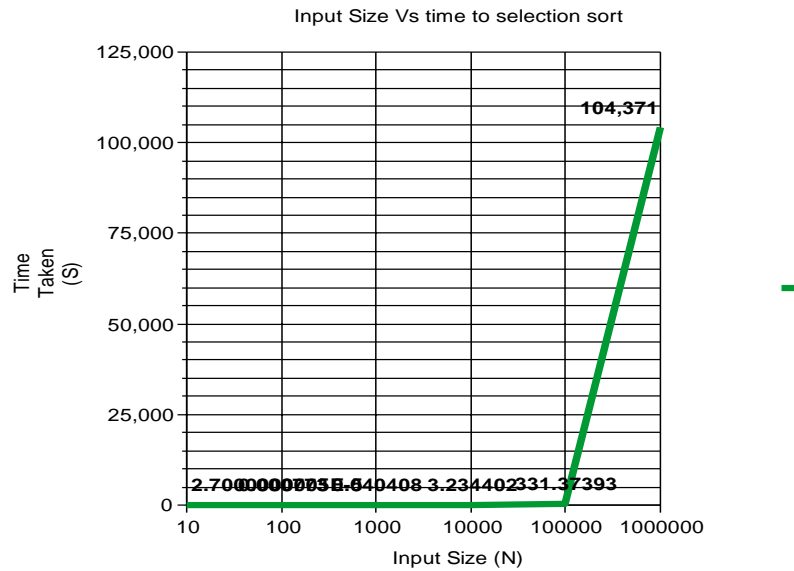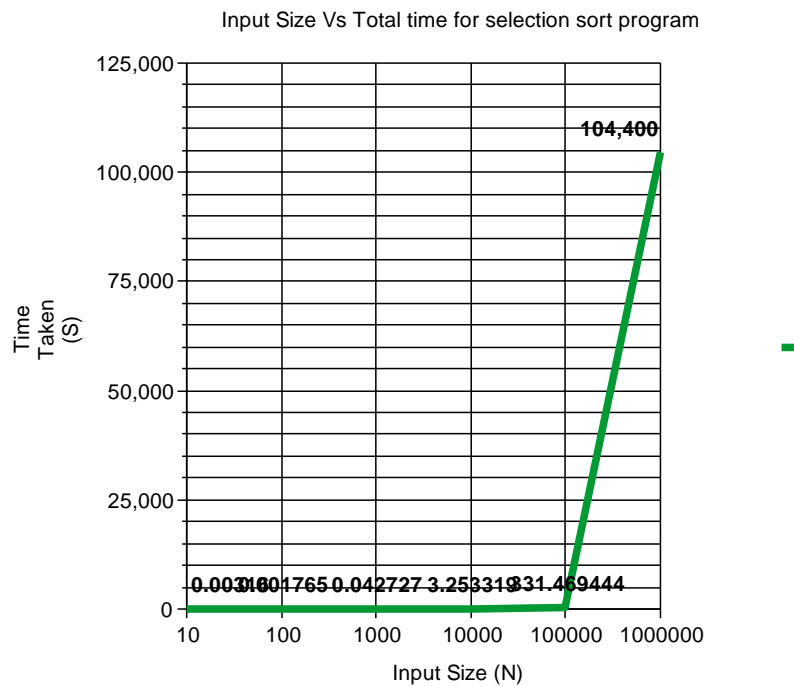
Graphs:

Input Size vs. Time to Merge Sort

Input Size vs. Total Time for Merge Sort Program to Run
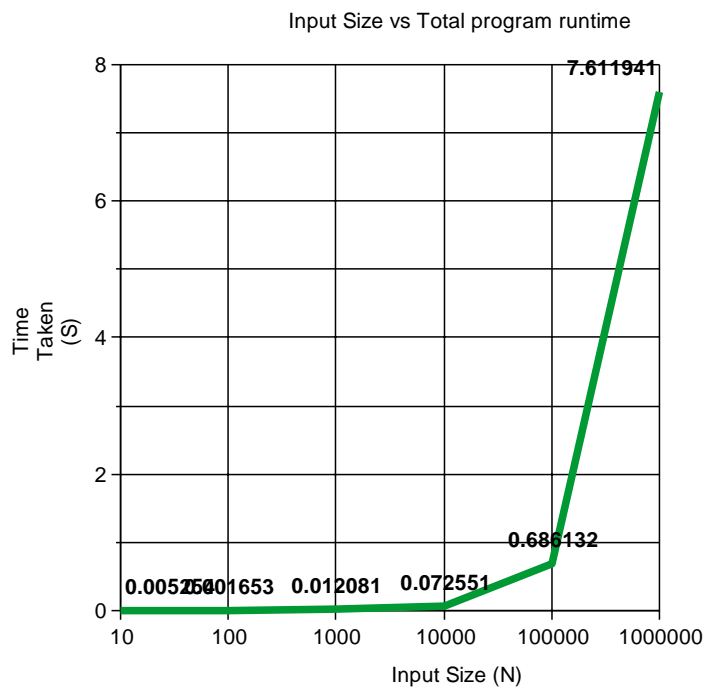
Input Size vs. Time to Selection Sort

Input Size Vs time to selection sort

Input Size vs. Total Time for Merge Sort Program to Run

Input Size Vs Total time for selection sort program

Graph interpretations:

I think these graphs tell us there is a massively increasing runtime as the input size exponentially rises. The amount of time it takes at first is totally negligible, only lasting fractions of a fraction of a second, but with the last couple input sizes, it takes a substantial amount of time to calculate.