AT CS H PERIOD 2
Mr. Scarpitta

Quadratic Sort Lab

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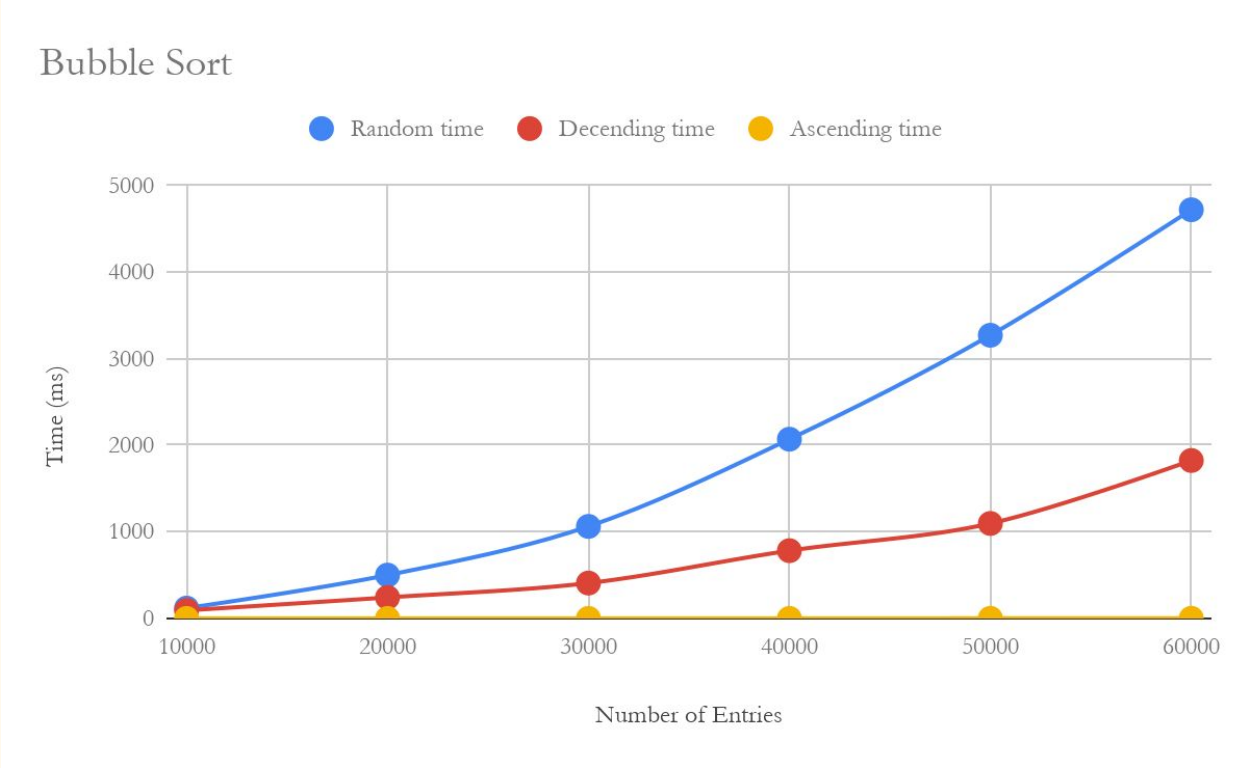
INTRODUCTION

In this lab, we ventured to discover more about sorting and runtime efficiency with a focus on quadratic sorts.

Part 1:

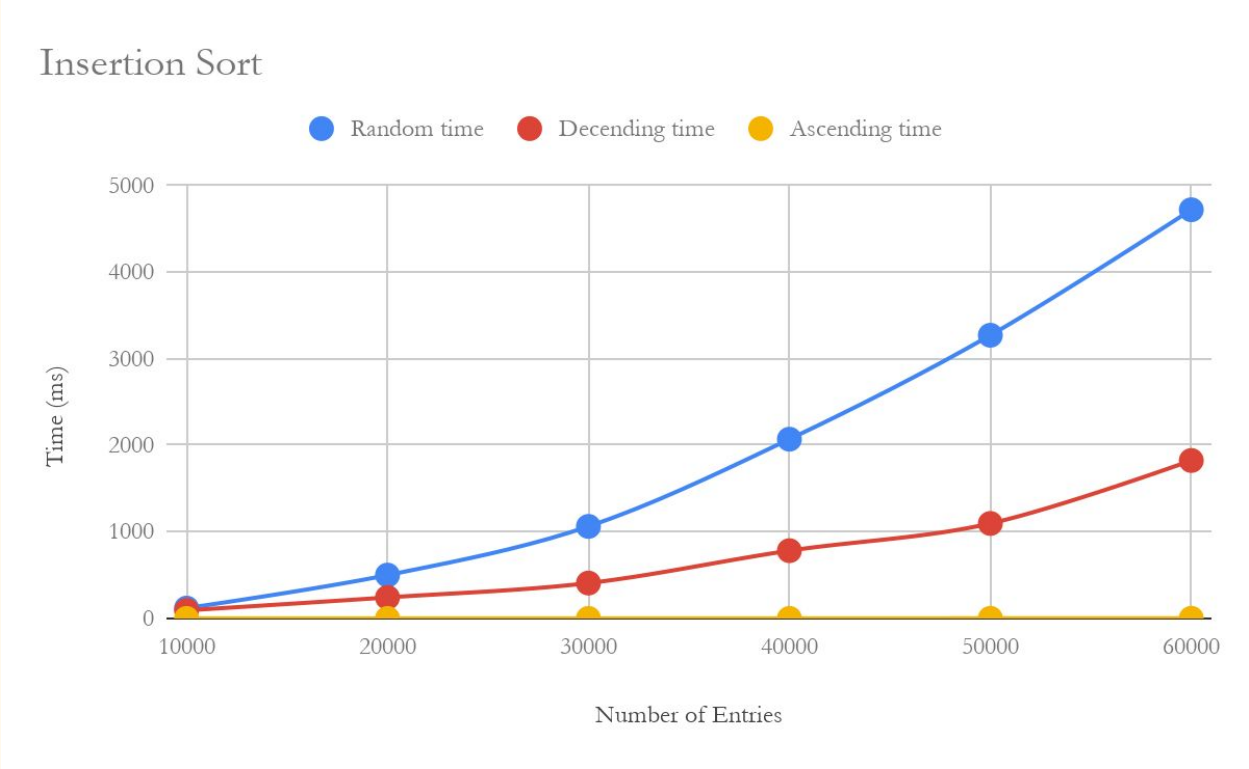
1. **Create 3 graphs using data from using bubble sort on 1) an array in random order, 2) an array in descending order, and 3) an array in order.**

n	Random Time (ms)	Descending Time (ms)	Ascending Time (ms)
10, 000	120	94	1
20, 000	501	243	1
30, 000	1063	409	1
40, 000	2070	783	1
50, 000	3270	1097	2
60, 000	4719	1824	2



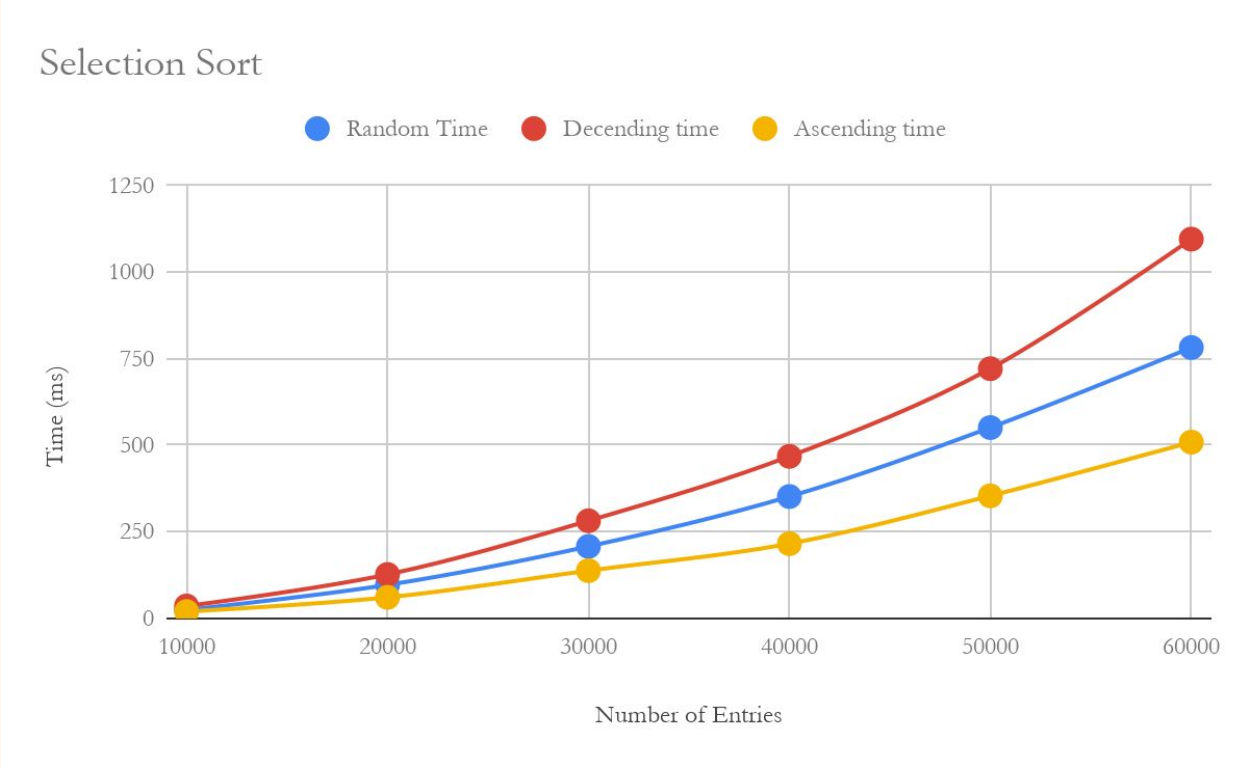
2. Create 3 graphs using data from using insertion sort on 1) an array in random order, 2) an array in descending order, and 3) an array in order.

n	Random Time (ms)	Descending Time (ms)	Ascending Time (ms)
10, 000	32	68	1
20, 000	108	201	1
30, 000	270	432	1
40, 000	425	751	1
50, 000	563	1198	1
60, 000	917	1619	2

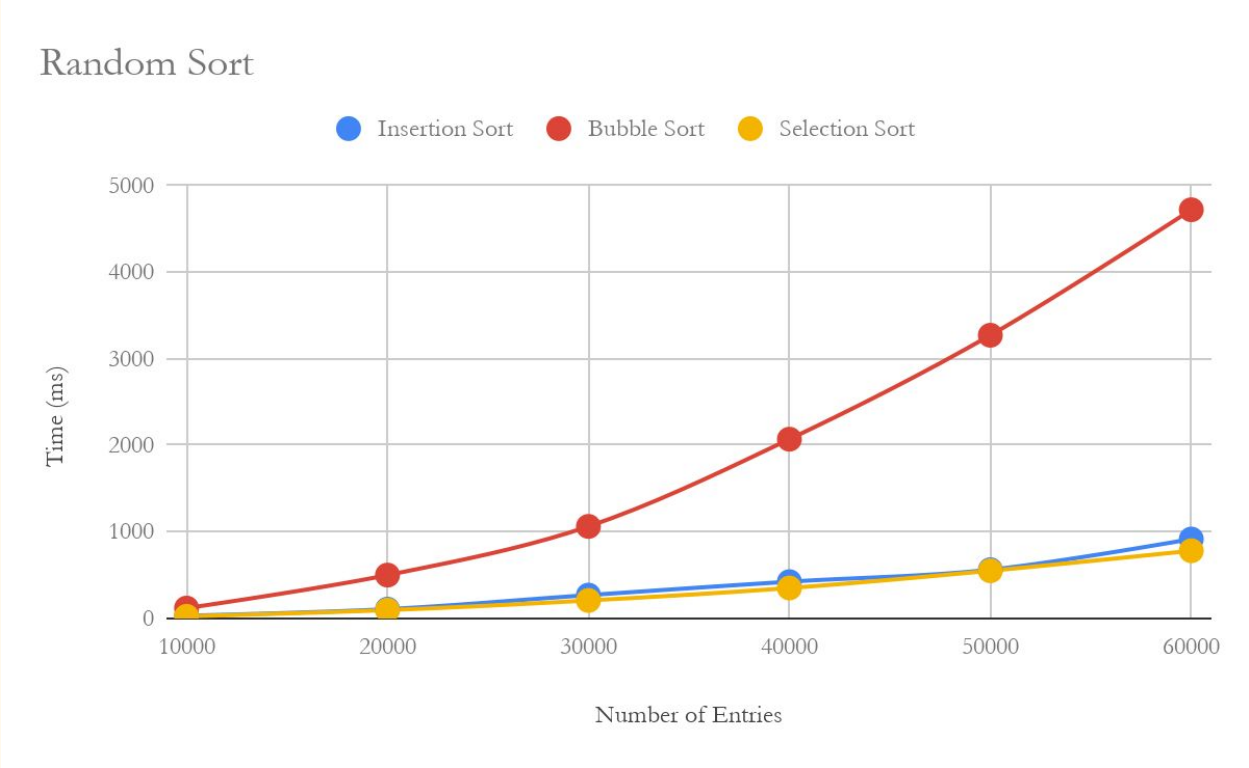


3. Create 3 graphs using data from using selection sort on 1) an array in random order, 2) an array in descending order, and 3) an array in order.

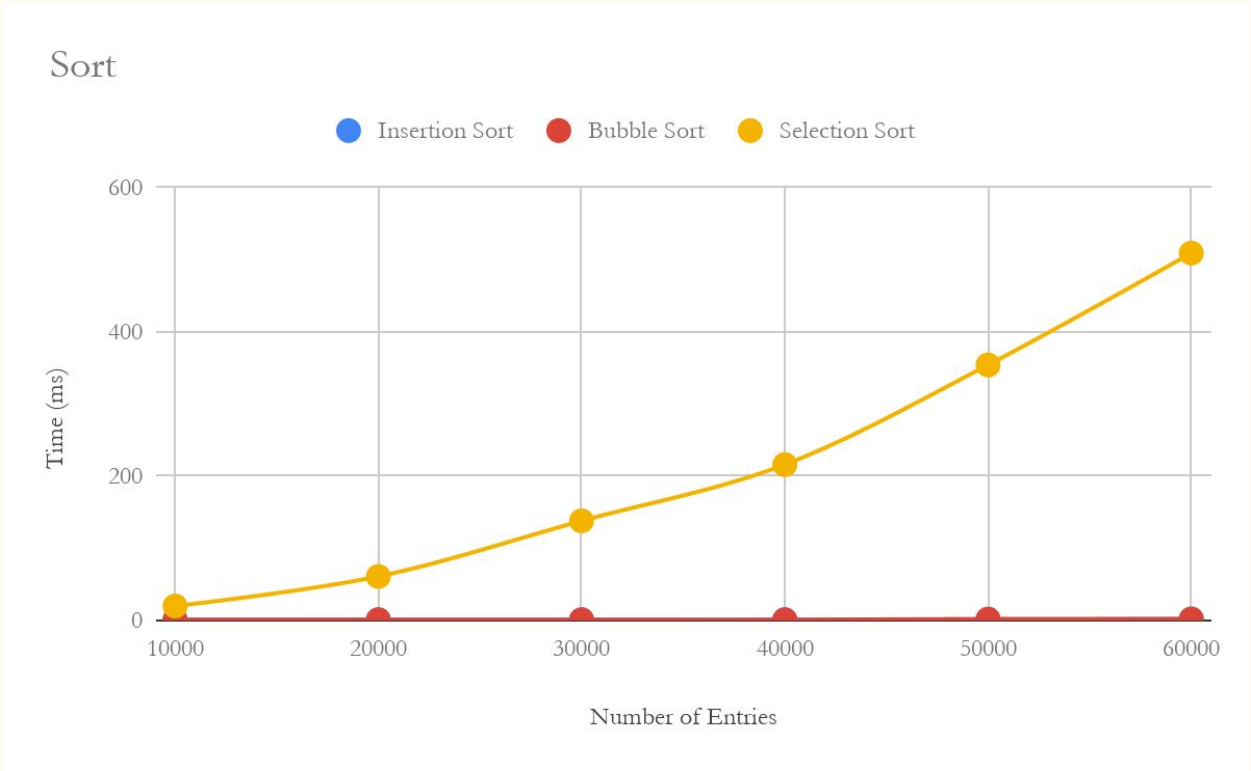
n	Random Time (ms)	Descending Time (ms)	Ascending Time (ms)
10, 000	25	36	20
20, 000	97	127	61
30, 000	208	282	138
40, 000	352	468	216
50, 000	551	721	354
60, 000	782	1095	509



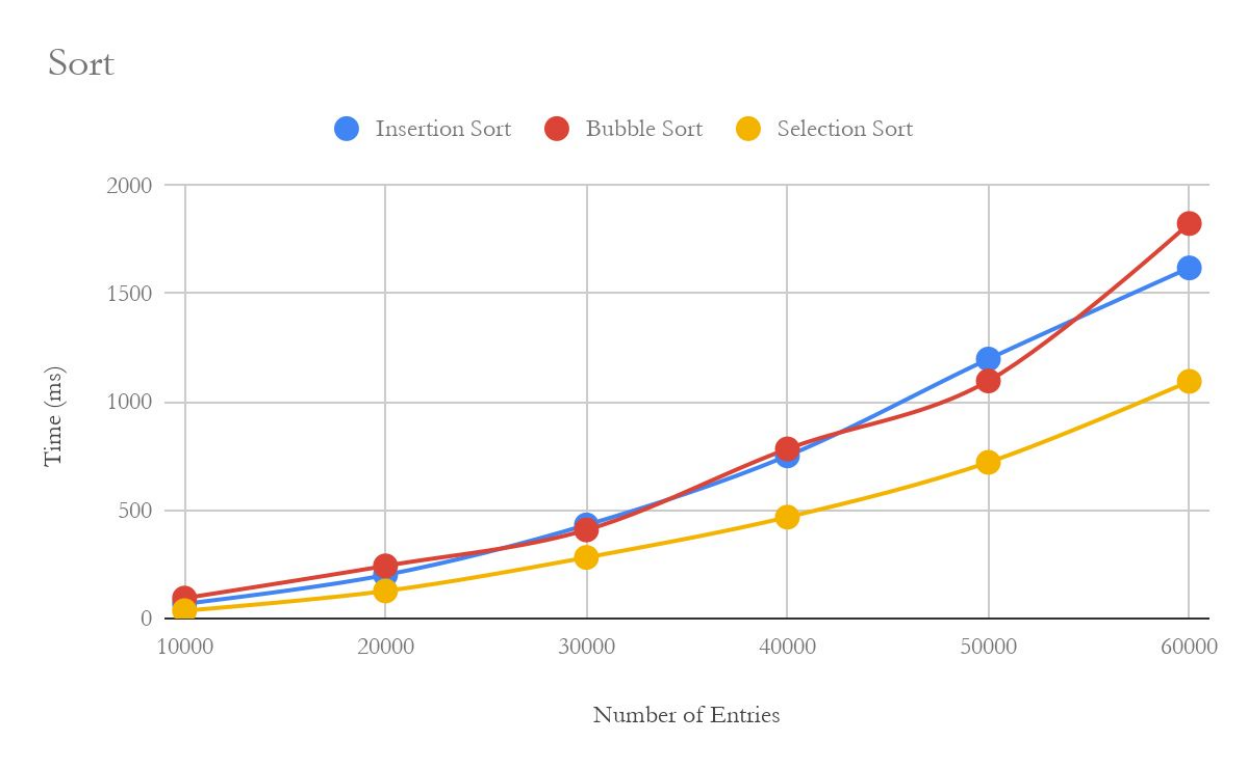
4. Create a chart and graph for a random array using 3 different sorts


Random Sort
Insertion Sort
Bubble Sort
Selection Sort
5000
4000
3000
2000
1000
0
Time (ms)
10000
20000
30000
40000
50000
60000
Number of Entries

5. Create a chart and graph for an ordered array using 3 different sorts.



6. Create a chart and graph for an array in descending order for 3 different sorts.



7. Explain why these are called quadratic sorts. $O(n^2)$

a. These sorts are called quadratic sorts because their asymptotic time complexity increases quadratically with the data size, n.

8. Which is the most efficient sort of a random array? Why?

a. The most efficient sort of a random array is an insertion sort. This is because it takes the least number of steps or comparisons which therefore is the most efficient, memory-wise.

9. Which is the least efficient sort of a reverse ordered array? Why?

a. The least efficient sort of a reverse array is a bubble sort. This is because it takes a large number of steps or comparisons, O(N^2) which therefore is the least efficient, memory-wise.

10. Which of these sort situations will produce a linear relationship O(n). Why?

a. Bubble sort and insertion sort with an array that is ordered to be ascending beforehand will produce a linear relationship because you only pass through each element once O(n) before exiting as the array is already sorted.

Part 2:

See OmSort.Java