

## Brief Analysis regarding different complexities of Insertion Sort Algorithm

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This experiment was done on a 21.5-inch iMac with Retina 4K display .

I found that the expected efficiency of each sort was inconsistent to the actual efficiency found in my results. According to the resulting graph,  $n^2$ , including the insertion sort, both came out to have the longest runtimes on average compared to all other functions. Furthermore, the insertion sort produced outcomes that were dangerously close to the  $n^2$  algorithm, which is not exactly normal. According to the actual runtime results of the insertion sort, it seemed correct that each run took longer the larger the size of the sort. My guess is that because of the complexity of the sort increasing exponentially, due to the fact that it was wholly unsorted before the size increase, the runtime also increased significantly and that is why it was comparable to the  $n^2$  algorithm. In general, the running time of an algorithm or data structure method increases with the input size, although it may also vary for different inputs of the same size.

	Seconds	Milliseconds	Microseconds		Data Size	Ins. Sort	n	nlogn	n^2
	0.069113	69.113	69113		10000	69.9	69.9	69.9	69.9
	0.069365	69.365	69365		20000	276.6	139.8	150.3	279.6
	0.071103	71.103	71103		40000	1107.1	279.6	321.7	1118.4
Avg.	0.0698603333	69.86033333	69860.33333		80000	4476.8	559.2	685.5	4473.6
	0.277612	277.612	277612		160000	17847.6	1118.4	1455.1	17894.4
	0.274529	274.529	274529		320000	71411.5	2236.8	3078.5	71577.6
	0.277665	277.665	277665						
Avg.	0.276602	276.602	276602						
	1.10297	1102.97	1.10E+07						
	1.10781	1107.81	1.11E+06						
	1.11058	1110.58	1.11E+06						
Avg.	1.10712	1107.12	4416030						
	4.48046	4480.46	4.48E+06						
	4.50709	4507.09	4.51E+06						
	4.44273	4442.73	4.44E+06						
Avg.	4.47676	4476.76	4476760						
	17.8838	17883.8	1.79E+07						
	17.8273	17827.3	1.78E+07						
	17.8318	17831.8	1.78E+07						
Avg.	17.84763333	17847.63333	17847633.33						
	71.6056	71605.6	7.16E+07						
	71.2142	71214.2	7.12E+07						
	71.4148	71414.8	7.14E+07						
Avg.	71.41153333	71411.53333	71411533.33						

