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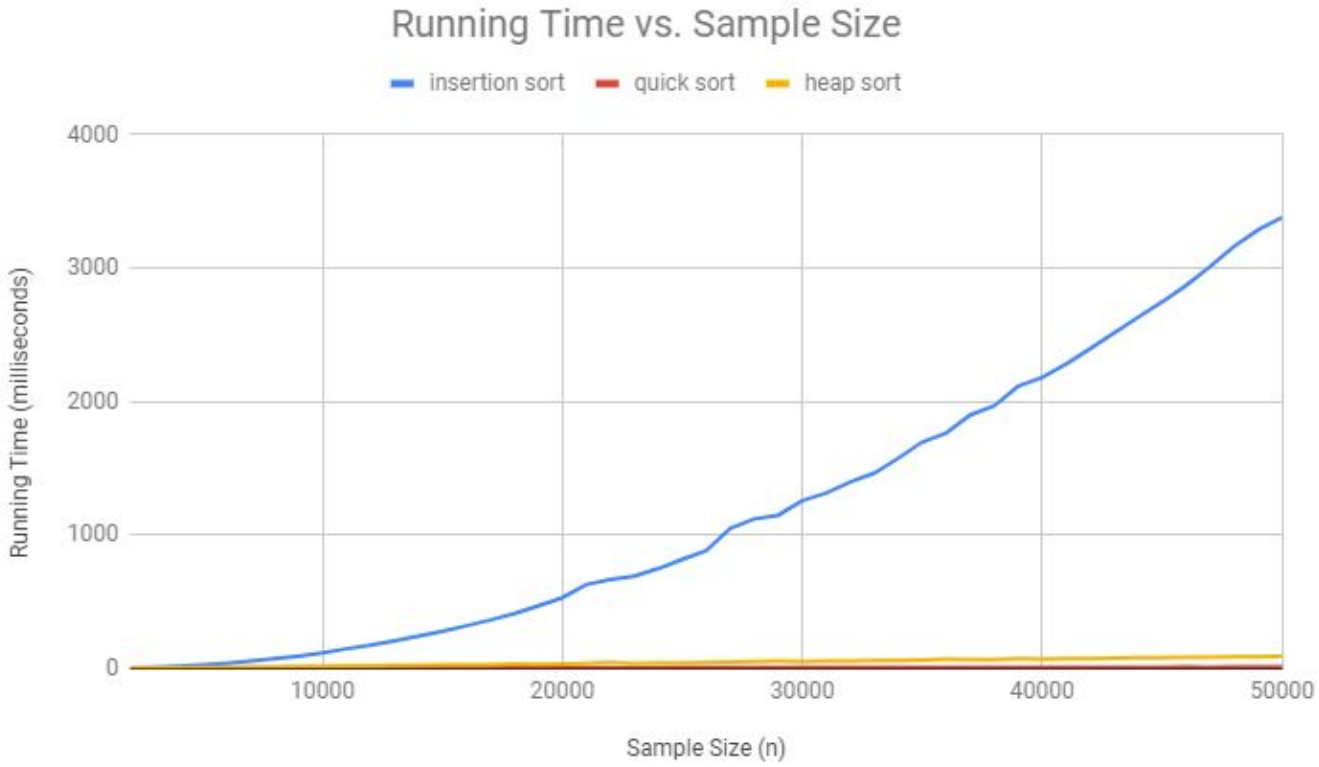
COT4400 Programming Assignment

SAMPLE SIZE DATA	RUNNING TIME (Milliseconds)			CONSTANT (RUNNING TIME / THEORETICAL TIME)		
n	insertion sort	quick sort	heap sort	insertion	quick	heap
1000	1.8	0	1	0.0000018	0	0.0001003433319
2000	5.8	0.2	2.6	0.00000145	0.00000005	0.0001185505721
3000	12.6	0.4	3.8	0.0000014	0.00000004444444444	0.0001096610193
4000	22.6	0.8	5.2	0.0000014125	0.00000005	0.0001086431085
5000	35.2	0.8	7	0.000001408	0.000000032	0.0001139349585
6000	51	0.6	8.6	0.000001416666667	0.00000001666666667	0.0001142030317
7000	69.4	1	10	0.000001416326531	0.00000002040816327	0.0001118418429
8000	90	1.4	11.6	0.00000140625	0.000000021875	0.000111832803
9000	114.6	1.2	13.6	0.000001414814815	0.00000001481481481	0.00011503841
10000	144.2	1.6	15.2	0.000001442	0.000000016	0.0001143913984
11000	171.2	1.8	16.8	0.000001414876033	0.00000001487603306	0.0001137615021
12000	204.4	2.2	18.6	0.000001419444444	0.00000001527777778	0.0001143848398
13000	240.6	2	20	0.000001423668639	0.00000001183431953	0.0001125740027
14000	275.8	2	22	0.000001407142857	0.00000001020408163	0.0001140937115
15000	316.6	2.4	23.4	0.000001407111111	0.00000001066666667	0.0001124512766
16000	360.2	2.4	25	0.00000140703125	0.000000009375	0.0001118805767
17000	409.6	2.4	29.4	0.000001417301038	0.00000000830449827	0.0001230613643
18000	466.4	2.6	29	0.000001439506173	0.000000008024691358	0.0001139745504
19000	527.4	3	30.8	0.000001460941828	0.000000008310249307	0.0001140485086
20000	626	3.4	36.2	0.000001565	0.0000000085	0.0001266822814
21000	662.8	3.6	40.4	0.000001502947846	0.000000008163265306	0.0001339877348
22000	688.6	3.6	36	0.000001422727273	0.000000007438016529	0.0001134377223
23000	745.2	3.6	37.6	0.000001408695652	0.000000006805293006	0.0001128265266
24000	815	4	39.4	0.000001414930556	0.000000006944444444	0.0001128235335
25000	881.2	4	41.2	0.00000140992	0.0000000064	0.0001128022283

26000	1048	4.4	45.6	0.000001550295858	0.00000000650887574	0.0001195840288
27000	1118.6	4.2	50.2	0.000001534430727	0.000000005761316872	0.0001263026094
28000	1146.2	4.6	51.6	0.000001461989796	0.000000005867346939	0.0001247437743
29000	1255.2	4.6	49.8	0.000001492508918	0.000000005469678954	0.0001158438053
30000	1312	4.8	52.4	0.000001457777778	0.000000005333333333	0.0001174413265
31000	1394.4	5	53	0.000001450988554	0.000000005202913632	0.0001145897884
32000	1461	5.2	54.8	0.000001426757813	0.000000005078125	0.0001144276817
33000	1573.4	5.8	56.8	0.000001444811754	0.000000005325987144	0.0001146696645
34000	1695	5.6	60.6	0.000001466262976	0.000000004844290657	0.0001184032207
35000	1761.8	5.8	65.8	0.000001438204082	0.000000004734693878	0.0001245439959
36000	1897.2	6.2	62.6	0.000001463888889	0.000000004783950617	0.0001148865148
37000	1966	6.2	65	0.000001436084733	0.000000004528853178	0.0001157646949
38000	2114.2	6.8	71	0.000001464127424	0.000000004709141274	0.0001228116503
39000	2178.6	6.2	68.4	0.00000143234714	0.000000004076265615	0.000114997358
40000	2280.8	7	70.2	0.0000014255	0.000000004375	0.0001147980781
41000	2395.8	6.8	72	0.000001425223081	0.000000004045211184	0.0001146028207
42000	2512	6.8	75	0.000001424036281	0.000000003854875283	0.0001162718101
43000	2630.4	7.2	76.2	0.000001422606814	0.000000003893996755	0.0001151304169
44000	2745.8	7.2	77.8	0.000001418285124	0.000000003719008264	0.0001146293076
45000	2869.4	7.6	80	0.000001416987654	0.00000000375308642	0.0001150096702
46000	3009.8	7.4	83	0.000001422400756	0.000000003497164461	0.0001164896051
47000	3161.4	8	83.8	0.000001431145315	0.000000003621548212	0.0001148798877
48000	3286.6	8.2	85.6	0.000001426475694	0.000000003559027778	0.0001146783082
49000	3380.2	8.2	86.8	0.000001407830071	0.000000003415243648	0.0001136952754
50000	3598.4	8.4	91.2	0.00000143936	0.00000000336	0.0001168508655

MAX VALUES FOR CONSTANT		
insertion	quick	heap
0.0000018	0.00000005	0.0001339877348


Running Time vs. Sample Size
insertion sort
quick sort
heap sort
4000
3000
2000
1000
0
Running Time (milliseconds)
10000
20000
30000
40000
50000
Sample Size (n)

The graph above has linear regression lines to estimate the complexity. Insertion-sort behaves as t(n) = n^2, while quick-sort and heap-sort behave as something between n and n^2, so likely nlog(n). We do know, however, that the O(n) of quick-sort = n^2, but its average complexity is nlog(n).