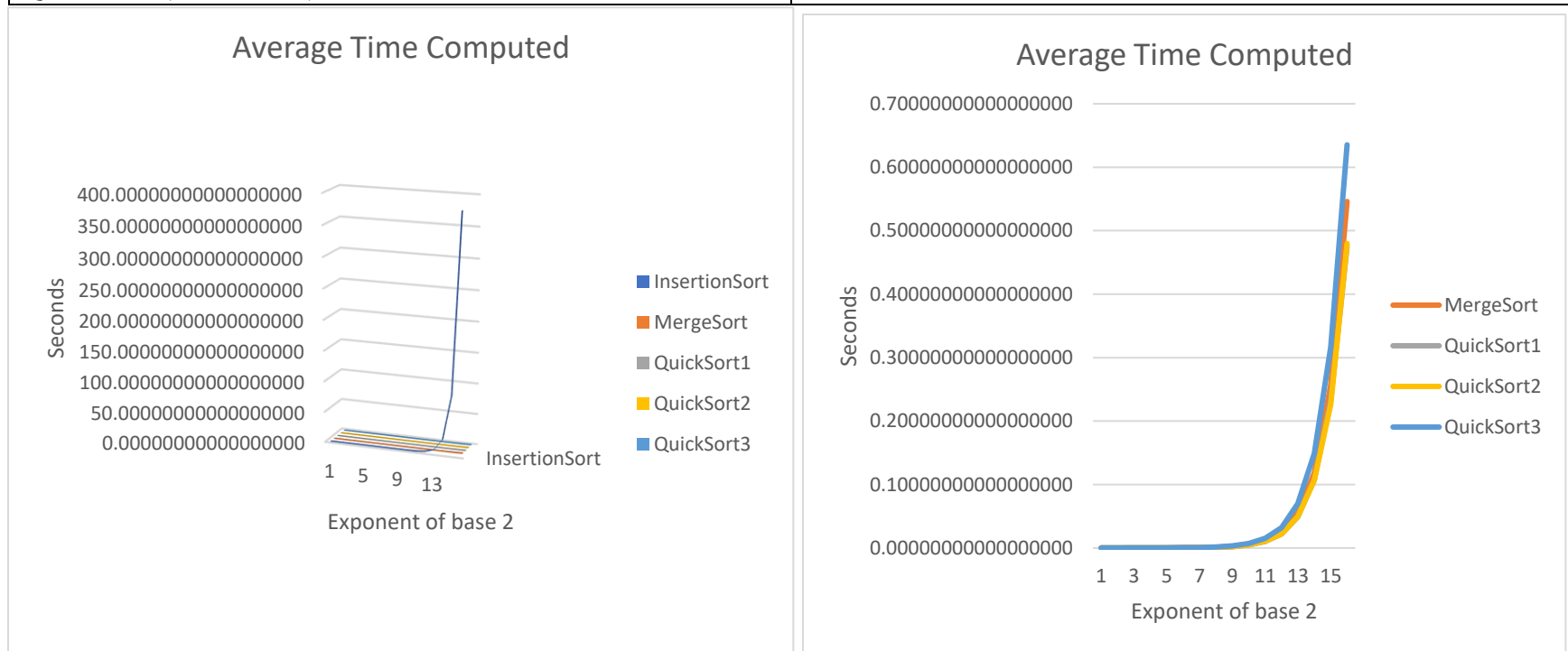


Ocean Lu  
 CS 3310  
 Professor Johannsen  
 10/03/2019

# Project #1: Output of Execution

Table Format: Test #	
Array Size	Numbers are time values (seconds), specific to the array size Please view my code: <a href="https://colab.research.google.com/drive/1xdrHHqchwUpGQlh8dRpBg5tgRgCMMYPF">https://colab.research.google.com/drive/1xdrHHqchwUpGQlh8dRpBg5tgRgCMMYPF</a>
Insertion Sort	
Merge Sort	
QuickSort1 (regular)	
QuickSort2 (insertion)	
QuickSort3 (randomized)	



Test 1															
2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>	2 <sup>7</sup>	2 <sup>8</sup>	2 <sup>9</sup>	2 <sup>10</sup>	2 <sup>11</sup>	2 <sup>12</sup>	2 <sup>13</sup>	2 <sup>14</sup>	2 <sup>15</sup>	2 <sup>16</sup>
1.97 8874 2065 4296 88e- 05	9.29 8324 5849 6093 8e- 06	1.47 8195 1904 2968 75e- 05	4.410 74371 33789 06e- 05	0.000 13589 85900 87890 62	0.00 0657 0816 0400 3906 2	0.00 1874 6852 8747 5586	0.0059 041976 928710 94	0.02 2984 5046 9970 703	0.09 5919 1322 3266 602	0.37 4818 3250 4272 46	1.50 7659 1968 5363 77	5.98 0031 7287 4450 7	24.5 1366 6868 2098 4	99.0 7651 0429 3823 2	396. 4576 7498 0163 6
0.00 0597 7153 7780 7617 2	1.83 5823 0590 8203 12e- 05	3.07 5599 6704 1015 6e- 05	7.414 81781 00585 94e- 05	0.000 14209 74731 44531 25	0.00 1098 3943 9392 0898 4	0.00 0540 9717 5598 1445 3	0.0012 025833 129882 812	0.00 2647 3999 0234 375	0.00 5637 4073 0285 6445	0.01 1820 0778 9611 8164	0.02 5551 5575 4089 3555	0.05 5828 8097 3815 918	0.11 8197 2026 8249 512	0.25 8239 0308 3801 27	0.54 4790 2679 4433 59
8.10 6231 6894 5312 5e- 06	1.38 2827 7587 8906 25e- 05	2.21 7292 7856 4453 12e- 05	5.793 57147 21679 69e- 05	0.000 11849 40338 13476 56	0.00 0298 0232 2387 6953 1	0.00 0484 4665 5273 4375	0.0009 200572 967529 297	0.00 2172 7085 1135 2539	0.00 4936 2182 6171 875	0.01 0532 3791 5039 0625	0.02 3880 0048 8281 25	0.04 8731 5654 7546 387	0.11 2969 3984 9853 516	0.22 9383 4686 2792 97	0.48 2353 4488 6779 785
1.04 9041 7480 4687 5e- 05	1.09 6725 4638 6718 75e- 05	1.88 3506 7749 0234 38e- 05	7.987 02239 99023 44e- 05	0.000 15306 47277 83203 12	0.00 0342 6074 9816 8945 3	0.00 0447 0348 3581 5429 7	0.0010 242462 158203 125	0.00 2348 8998 4130 8593 8	0.00 4535 4366 3024 9023 4	0.01 0340 4521 9421 3867	0.02 2886 0378 2653 8086	0.05 1083 3263 3972 168	0.11 1110 4488 3728 027	0.24 1670 6085 2050 78	0.51 2037 2772 2167 97
3.74 3171 6918 9453 1e- 05	2.16 9609 0698 2421 88e- 05	8.15 3915 4052 7343 8e- 05	0.000 12063 98010 25390 62	0.000 23722 64862 06054 7	0.00 1151 5617 3706 0546 9	0.00 0741 4817 8100 5859 4	0.0016 424655 914306 64	0.00 3305 6735 9924 3164	0.00 7994 1749 5727 539	0.01 4928 5793 3044 4336	0.03 3414 6022 7966 3086	0.07 3976 7551 4221 191	0.14 6190 6433 1054 688	0.31 5525 2933 5021 97	0.65 1159 7633 3618 16

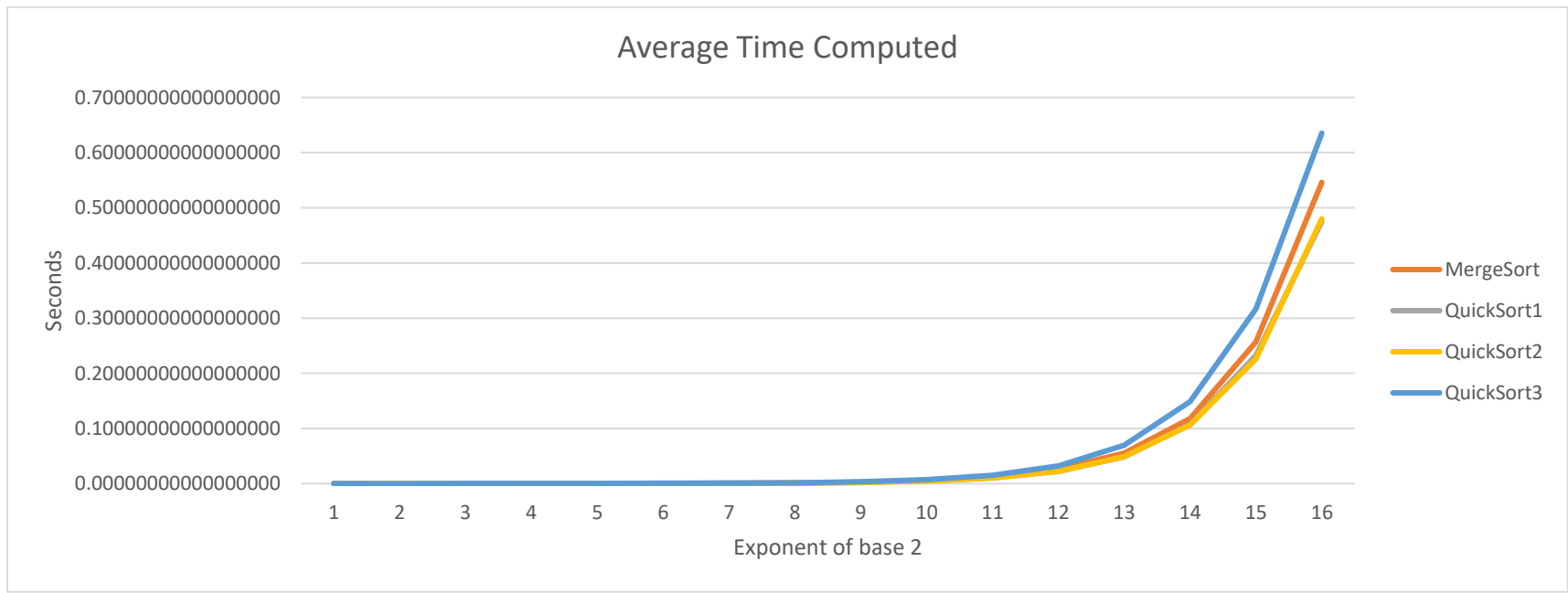
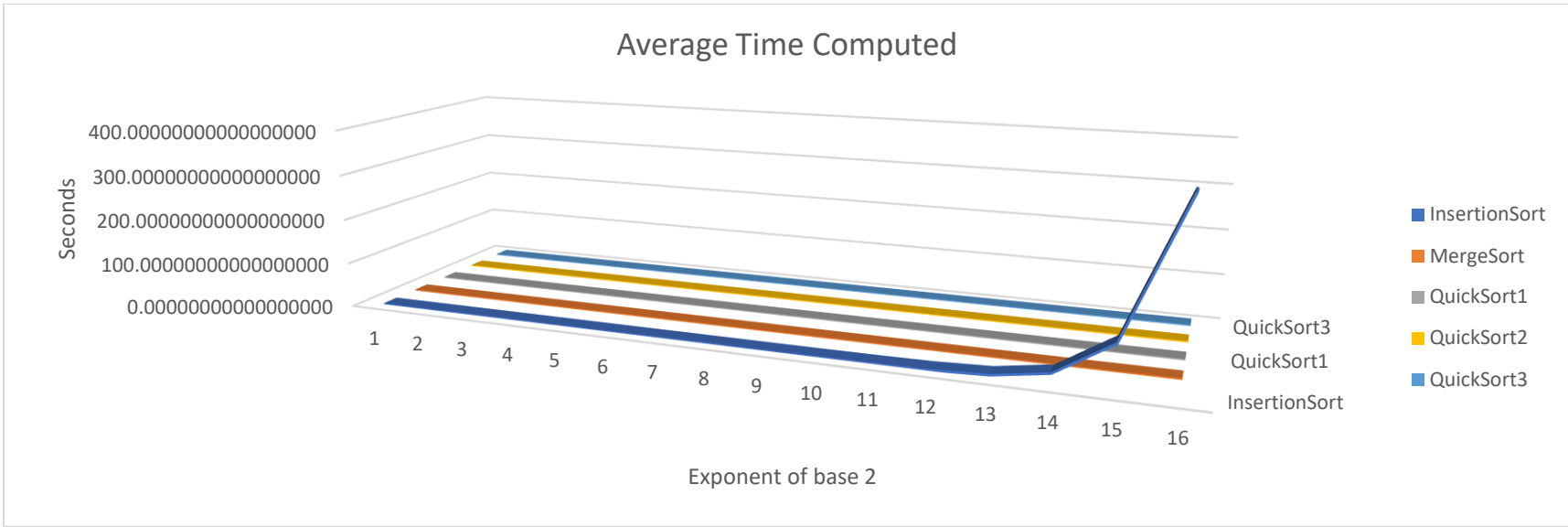
Test 2															
2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>	2 <sup>7</sup>	2 <sup>8</sup>	2 <sup>9</sup>	2 <sup>10</sup>	2 <sup>11</sup>	2 <sup>12</sup>	2 <sup>13</sup>	2 <sup>14</sup>	2 <sup>15</sup>	2 <sup>16</sup>
1.40 6669 6166 9921 88e- 05	2.83 7181 0913 0859 38e- 05	1.83 5823 0590 8203 12e- 05	5.12 5999 4506 8359 4e- 05	0.000 13875 96130 37109 38	0.000 40173 53057 86132 8	0.00 1508 2359 3139 6484 4	0.00 5150 5565 6433 1055	0.02 1870 6130 9814 453	0.09 3898 5347 7478 027	0.38 6387 1097 5646 97	1.51 7772 4361 4196 78	6.06 2641 8590 5456 5	23.2 9828 9060 5926 5	97.0 0371 5276 7181 4	379. 5542 7718 1625 37
2.02 6557 9223 6328 12e- 05	6.58 0352 7832 0312 5e- 05	5.38 8259 8876 9531 25e- 05	6.89 0296 9360 3515 6e- 05	0.000 12612 26488 34283 44726 56	0.000 26488 30413 81835 94	0.00 0522 3751 0681 1523 4	0.00 1271 9631 6718 1950 6836	0.00 2461 5407 8102 2922 3633	0.00 5407 1528 8102 1118 1641	0.01 1528 0151 3671 875	0.02 5415 4205 3222 6562	0.05 5023 9086 1511 2305	0.12 0501 7566 6809 082	0.25 1569 5095 0622 56	0.55 2760 1242 0654 3
7.15 2557 3730 4687 5e- 06	1.78 8139 3432 6171 88e- 05	2.83 7181 0913 0859 38e- 05	4.88 7580 8715 8203 1e- 05	0.000 10538 10119 62890 62	0.000 17857 55157 47070 3	0.00 0559 8068 2373 0468 8	0.00 0959 8731 9946 2890 6	0.00 2230 1673 8891 6015 6	0.00 5354 8812 8662 1094	0.01 0283 9469 9096 6797	0.02 1699 1901 3977 0508	0.04 9114 9425 5065 918	0.10 3437 9005 4321 289	0.24 2901 0868 0725 098	0.48 0592 2508 2397 46
7.62 9394 5312 5e- 06	1.69 2771 9116 2109 38e- 05	3.88 6222 8393 5546 9e- 05	6.15 1199 3408 2031 2e- 05	0.000 10514 25933 83789 06	0.000 17404 55627 44140 62	0.00 0380 7544 7082 5195 3	0.00 0877 8572 0825 1953 1	0.00 2046 1082 4584 9609 4	0.00 4572 1530 9143 0664	0.01 0710 2394 1040 039	0.02 1375 1792 9077 1484	0.04 8872 7092 7429 199	0.10 5885 5056 7626 953	0.21 3058 7100 9826 66	0.46 2539 9112 7014 16
2.07 4241 6381 8359 38e- 05	3.36 1701 9653 3203 1e- 05	6.50 8827 2094 7265 6e- 05	9.53 6743 1640 625e -05	0.000 20766 25823 97460 94	0.000 35858 15429 6875	0.00 0666 6183 4716 7968 8	0.00 1487 0166 7785 6445 3	0.00 3215 3129 5776 3672	0.00 7148 5042 5720 2148 4	0.01 5147 6860 0463 8672	0.03 2023 6682 8918 457	0.07 0553 0643 4631 348	0.14 7882 4615 4785 156	0.31 0831 0699 4628 906	0.64 0704 1549 6826 17

Test 3															
2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>	2 <sup>7</sup>	2 <sup>8</sup>	2 <sup>9</sup>	2 <sup>10</sup>	2 <sup>11</sup>	2 <sup>12</sup>	2 <sup>13</sup>	2 <sup>14</sup>	2 <sup>15</sup>	2 <sup>16</sup>
1.74 0455 6274 4140 62e- 05	6.91 4138 7939 4531 25e- 06	1.95 5032 3486 3281 25e- 05	4.673 00415 03906 25e- 05	0.000 15687 94250 48828 12	0.000 60439 10980 22460 9	0.00 2542 4957 2753 9062 5	0.00 5420 4463 9587 4023 4	0.02 2193 6702 7282 715	0.09 4147 9206 0852 051	0.37 7488 8515 4724 12	1.52 1523 9524 8413 09	5.96 1391 6873 9318 85	23.6 7223 4058 3801 27	94.8 7293 3864 5935	381. 5673 3727 4551 4
1.23 9776 6113 2812 5e- 05	1.59 7404 4799 8046 88e- 05	3.21 8650 8178 7109 4e- 05	6.580 35278 32031 25e- 05	0.000 16736 98425 29296 88	0.000 36573 41003 41796 9	0.00 0843 7633 5144 0429 7	0.00 1094 5796 9665 5273 4	0.00 2727 5085 4492 1875	0.00 6945 8484 6496 582	0.01 1820 3163 1469 7266	0.02 5573 4920 5017 09	0.05 5113 5540 0085 449	0.11 7387 0563 5070 801	0.26 1468 6489 1052 246	0.54 5241 5943 1457 52
9.29 8324 5849 6093 8e- 06	1.07 2883 6059 5703 12e- 05	2.43 1869 5068 3593 75e- 05	4.720 68786 62109 375e- 05	0.000 12063 98010 25390 62	0.000 31566 61987 30468 75	0.00 0617 5041 1987 3046 9	0.00 0931 9782 2570 8007 8	0.00 2063 2743 8354 4922	0.00 4575 2525 3295 8984	0.01 0151 8630 9814 4531	0.02 1777 3914 3371 582	0.05 0848 9608 7646 4844	0.10 6596 9467 1630 86	0.21 9527 7214 0502 93	0.47 5374 4602 2033 69
1.09 6725 4638 6718 75e- 05	1.04 9041 7480 4687 5e- 05	2.33 6502 0751 9531 25e- 05	4.982 94830 32226 56e- 05	0.000 14925 00305 17578 12	0.000 37980 07965 08789 06	0.00 0642 7764 8925 7812 5	0.00 0855 2074 4323 7304 7	0.00 2368 9270 0195 3125	0.00 4799 8428 3447 2656	0.00 9870 5291 7480 4688	0.02 1442 4133 3007 8125	0.04 7096 7292 7856 445	0.10 4990 2439 1174 316	0.22 5490 3316 4978 027	0.48 2301 2351 9897 46
2.78 9497 3754 8828 12e- 05	2.50 3395 0805 6640 62e- 05	4.50 6111 1450 1953 1e- 05	0.000 11610 98480 22460 94	0.000 28276 44348 14453 1	0.000 60081 48193 35937 5	0.00 1165 1515 9606 9336	0.00 1471 2810 5163 5742 2	0.00 3260 1356 5063 4765 6	0.00 7107 0194 2443 8476 6	0.01 5625 7152 5573 7305	0.03 0518 7702 1789 5508	0.06 8942 3084 2590 332	0.15 0809 7648 6206 055	0.33 7228 0597 6867 676	0.61 7619 2760 4675 29

Test 4															
$2^1$	$2^2$	$2^3$	$2^4$	$2^5$	$2^6$	$2^7$	$2^8$	$2^9$	$2^{10}$	$2^{11}$	$2^{12}$	$2^{13}$	$2^{14}$	$2^{15}$	$2^{16}$
1.59 7404 4799 8046 88e- 05	2.98 0232 2387 6953 12e- 05	1.64 5088 1958 0078 12e- 05	5.054 47387 69531 25e- 05	0.000 20480 15594 48242 2	0.00 0512 8383 6364 7460 9	0.00 1524 4483 9477 5390 6	0.00 5447 1492 7673 3398 4	0.02 2506 2370 3002 9297	0.09 0908 0505 3710 938	0.40 9631 0138 7023 926	1.52 8393 5070 0378 42	6.04 5779 2282 1044 9	24.2 4061 7036 8194 58	95.6 2985 6109 6191 4	387. 2707 4885 3683 5
1.02 5199 8901 3671 88e- 05	1.93 1190 4907 2265 62e- 05	3.40 9385 6811 5234 4e- 05	8.249 28283 69140 62e- 05	0.000 18644 33288 57421 88	0.00 0434 8754 8828 125	0.00 0761 0321 0449 2187 5	0.00 1154 4227 6000 9765 6	0.00 2448 3203 8879 3945 3	0.00 5378 7231 4453 125	0.01 1855 3638 4582 5195	0.02 5105 4763 7939 453	0.05 5154 0851 5930 176	0.11 7456 6745 7580 566	0.25 6495 4757 6904 297	0.53 9378 4046 1730 96
1.19 2092 8955 0781 25e- 05	1.52 5878 9062 5e- 05	2.76 5655 5175 7812 5e- 05	5.173 68316 65039 06e- 05	0.000 10991 09649 65820 31	0.00 0333 7860 1074 2187 5	0.00 0769 8535 9191 8945 3	0.00 0831 3655 8532 7148 4	0.00 2202 0339 9658 2031 2	0.00 4239 7975 9216 3086	0.01 0725 9750 3662 1094	0.02 2151 4701 8432 6172	0.04 7086 9541 1682 129	0.10 6628 8948 0590 82	0.21 6749 9065 3991 7	0.46 1458 4445 9533 69
9.53 6743 1640 625e -06	4.62 5320 4345 7031 25e- 05	2.81 3339 2333 9843 75e- 05	4.935 26458 74023 44e- 05	0.000 12469 29168 70117 2	0.00 0298 0232 2387 6953 1	0.00 0792 7417 7551 2695 3	0.00 0886 2018 5852 0507 8	0.00 2172 4700 9277 3437 5	0.00 4855 8712 0056 1523 4	0.01 1092 4243 9270 0195	0.02 1273 8513 9465 332	0.04 8629 2839 0502 93	0.10 4743 4806 8237 305	0.22 9692 4591 0644 53	0.46 3251 8291 4733 887
2.33 6502 0751 9531 25e- 05	3.55 2436 8286 1328 1e- 05	5.62 6678 4667 9687 5e- 05	0.000 10752 67791 74804 69	0.000 24318 69506 83593 75	0.00 0520 7061 7675 7812 5	0.00 0689 7449 4934 0820 3	0.00 1426 9351 9592 2851 6	0.00 3338 5753 6315 9179 7	0.00 7014 0361 7858 8867	0.01 5080 9288 0249 0234	0.03 2470 2262 8784 18	0.06 5835 7143 4020 996	0.15 3918 2662 9638 672	0.29 3185 9493 2556 15	0.63 4165 0485 9924 32

Test 5															
$2^1$	$2^2$	$2^3$	$2^4$	$2^5$	$2^6$	$2^7$	$2^8$	$2^9$	$2^{10}$	$2^{11}$	$2^{12}$	$2^{13}$	$2^{14}$	$2^{15}$	$2^{16}$
1.40 6669 6166 9921 88e- 05	9.53 6743 1640 625e -06	1.74 0455 6274 4140 62e- 05	2.95 6390 3808 5937 5e- 05	0.000 11515 61737 06054 69	0.000 46133 99505 61523 44	0.00 1351 5949 2492 6757 8	0.00 5556 1065 6738 2812 5	0.02 2630 4531 0974 121	0.09 6778 3927 9174 805	0.37 8109 9319 4580 08	1.51 8526 3156 8908 7	6.05 9403 8963 3178 7	24.3 5261 3210 6781	97.5 9611 7734 9090 6	388. 0998 1560 7070 9
2.02 6557 9223 6328 12e- 05	1.40 6669 6166 9921 88e- 05	2.24 1134 6435 5468 75e- 05	4.86 3739 0136 7187 5e- 05	0.000 12421 60797 11914 06	0.000 25486 94610 59570 3	0.00 0580 7876 5869 1406 2	0.00 1099 1096 4965 8203 1	0.00 2569 1986 0839 8437 5	0.00 7201 6716 0034 1797	0.01 1653 1848 9074 707	0.02 5860 0711 8225 0977	0.05 4951 6677 8564 453	0.11 6628 6468 5058 594	0.25 6480 9322 3571 78	0.54 7772 1691 1315 92
3.45 7069 3969 7265 6e- 05	1.14 4409 1796 875e -05	2.43 1869 5068 3593 75e- 05	3.50 4753 1127 9296 9e- 05	7.915 49682 61718 75e- 05	0.000 17237 66326 90429 7	0.00 0501 8711 0900 8789 1	0.00 0893 8312 5305 1757 8	0.00 2077 1026 6113 2812 5	0.00 5140 0661 4685 0586	0.01 0058 4030 1513 6719	0.02 2065 1626 5869 1406	0.04 8159 3608 8562 012	0.10 7539 6537 7807 617	0.25 3460 4072 5708 01	0.47 5456 2377 9296 875
9.05 9906 0058 5937 5e- 06	1.14 4409 1796 875e -05	1.78 8139 3432 6171 88e- 05	6.79 4929 5043 9453 1e- 05	7.700 92010 49804 69e- 05	0.000 19311 90490 72265 62	0.00 0519 0372 4670 4101 6	0.00 0953 1974 7924 8046 9	0.00 2073 2879 6386 7187 5	0.00 4908 8001 2512 207	0.01 0571 0029 6020 5078	0.02 3614 6450 0427 246	0.05 0343 5134 8876 953	0.10 4862 4515 5334 473	0.21 9440 6986 2365 723	0.47 9238 9869 6899 414
1.81 1981 2011 7187 5e- 05	2.33 6502 0751 9531 25e- 05	3.69 5487 9760 7421 9e- 05	7.08 1031 7993 1640 6e- 05	0.000 19454 95605 46875	0.000 37074 08905 02929 7	0.00 0673 5324 8596 1914 1	0.00 1442 1939 8498 5351 6	0.00 3491 6400 9094 2383	0.00 6934 1659 5458 9844	0.01 4786 2434 3872 0703	0.03 1386 3754 2724 6094	0.07 0451 4980 3161 621	0.14 3799 3049 6215 82	0.32 7086 6870 8801 27	0.63 2770 2999 1149 9

Average															
2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>	2 <sup>7</sup>	2 <sup>8</sup>	2 <sup>9</sup>	2 <sup>10</sup>	2 <sup>11</sup>	2 <sup>12</sup>	2 <sup>13</sup>	2 <sup>14</sup>	2 <sup>15</sup>	2 <sup>16</sup>
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.38	1.51	6.02	24.0	96.8	386.5
0016	0016	0017	0044	0150	0527	1760	5495	2437	4330	5287	8775	1849	1548	3582	89970
2601	7846	3091	4412	2990	4772	2920	6912	0956	4061	0464	0816	6799	4046	6683	77941
4709	6796	8884	2314	7226	6440	5322	9943	4208	8896	3249	3452	4689	9360	0444	80000
473	875	277	453	563	430	265	847	980	480	500	000	000	0000	0000	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.11	0.25	0.545
0132	0026	0034	0067	0149	0483	0649	1164	2570	6114	1735	5501	5214	8034	6850	98851
1792	7028	6660	9969	2500	7512	7859	5317	8198	2921	3916	2035	4050	2674	7194	20391
6025	8085	6140	7875	3051	9699	9548	0776	5473	4477	1682	3698	5981	2553	5190	8400
391	937	137	977	758	707	340	367	632	539	120	730	440	700	400	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.10	0.23	0.475
0014	0013	0025	0048	0106	0259	0586	0907	2149	4849	0350	2314	8788	7434	2404	04696
2097	8282	3677	1605	7161	6855	7004	4211	0573	2431	5134	6438	3567	5588	5181	84600
4731	7758	3681	5297	5600	1635	3945	1206	8830	6406	5825	5986	8100	6840	2744	8200
445	789	641	852	586	742	313	055	566	250	190	330	580	800	100	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.10	0.22	0.479
0009	0019	0025	0061	0121	0277	0556	0919	2201	4734	0516	2118	9205	6318	5870	87384
5367	2165	4154	7027	8318	5192	4689	3420	9386	4207	9296	4253	1124	4261	5615	79614
4316	3747	2053	2827	9392	2607	6362	4101	2915	7636	2646	6926	5727	3220	9973	2500
406	559	223	148	090	422	305	562	038	718	480	260	530	200	100	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.06	0.14	0.31	0.635
0025	0027	0056	0102	0233	0600	0787	1493	3322	7239	5113	1962	9951	8520	6771	28370
5107	8472	9820	0908	0780	4810	3058	9785	2675	5801	8305	7285	8680	0881	4118	85723
8796	9003	4040	3557	0292	3332	3190	0036	3234	5441	6640	0036	5725	9580	9575	8700
387	906	527	129	969	519	918	621	863	894	620	620	090	000	100	





For verification purposes, print the original arrays and the corresponding sorted arrays for n up to 32, but the cost of printing should not be included for comparing the performance of different algorithms. They will just be included for verification purposes.

### Sample output looks like:

array size 2<sup>1</sup> or 2

```
[0.17202484 0.92776094]
insertionSort: 6.9141387939453125e-06
[0.38253493 0.71091401]
mergeSort: 6.67572021484375e-06
[0.89191327 0.73251606]
quickSort1 (regular): 9.5367431640625e-06
[0.49768093 0.84771504]
quickSort2 (insertion): 1.0013580322265625e-05
[0.09903728 0.35502602]
quickSort3 (randomized): 2.6226043701171875e-05
```

array size 2<sup>2</sup> or 4

```
[0.87374095 0.84719986 0.33893764 0.86268776]
insertionSort: 1.1205673217773438e-05
[0.55033963 0.48902338 0.93087689 0.48715425]
mergeSort: 1.811981201171875e-05
[0.75421553 0.42994045 0.47099084 0.48490642]
quickSort1 (regular): 1.3589859008789062e-05
[0.82459237 0.58088959 0.55451856 0.56513764]
quickSort2 (insertion): 6.842613220214844e-05
[0.05505832 0.75484385 0.69036464 0.77982398]
quickSort3 (randomized): 3.0279159545898438e-05
```

array size 2<sup>3</sup> or 8

```
[0.20281546 0.21869645 0.80367521 0.54694234 0.74687282 0.43402816
 0.21820495 0.49080376]
insertionSort: 1.811981201171875e-05
[0.06359529 0.78438283 0.18220747 0.39376885 0.8607661 0.28159154
 0.44885606 0.95929241]
mergeSort: 3.7670135498046875e-05
[0.86686247 0.37984916 0.35405788 0.45333233 0.99640667 0.56239746
 0.97753964 0.7045407 ]
quickSort1 (regular): 2.7179718017578125e-05
```

### My code looks like:

```
import time
import numpy as np

def makeArr(n):
    array = np.random.rand(n)
    return array

arrSize = 2
counter = 1
while (arrSize < 65537):
    print ("array size 2^", counter, "or", arrSize)

    # insertionSort
    arr = makeArr(arrSize)
    print (arr)
    t0 = time.time()
    insertionSort(arr)
    t1 = time.time()
    total = t1-t0
    print ("insertionSort:", total)

    # mergeSort
    arr = makeArr(arrSize)
    print (arr)
    t0 = time.time()
    mergeSort(arr)
    t1 = time.time()
    total = t1-t0
    print ("mergeSort:", total)

    # quickSort1 (regular)
    arr = makeArr(arrSize)
    print (arr)
    t0 = time.time()
    quickSort1(arr,0,len(arr)-1)
    t1 = time.time()
    total = t1-t0
    print ("quickSort1 (regular):", total)

    # quickSort2 (insertion)
    arr = makeArr(arrSize)
    print (arr)
    t0 = time.time()
    quickSort2(arr,0, (len(arr)-1))
    t1 = time.time()
    total = t1-t0
    print ("quickSort2 (insertion):", total)

    # quickSort3 (randomized)
    arr = makeArr(arrSize)
    print (arr)
    t0 = time.time()
    quickSort3(arr,0, (len(arr)-1))
    t1 = time.time()
    total = t1-t0
    print ("quickSort3 (randomized):", total)

    arrSize = arrSize * 2
    counter = counter + 1
    print()
```

```
[0.1487643 0.63044081 0.18008724 0.03712344 0.69466421 0.230715
0.02331824 0.48969593]
quickSort2 (insertion): 3.314018249511719e-05
[0.12598284 0.7069573 0.02419494 0.41062307 0.43451067 0.23185342
0.6579832 0.80219264]
quickSort3 (randomized): 6.008148193359375e-05
```

array size 2<sup>4</sup> or 16

```
[0.04614838 0.73423875 0.89202241 0.63711957 0.57166352 0.61011786
0.05885631 0.01683178 0.58233653 0.18612887 0.75055075 0.88730349
0.99613852 0.71489715 0.86243534 0.192968 ]
insertionSort: 4.029273986816406e-05
[0.8745513 0.97100824 0.72110246 0.39874256 0.07070863 0.76687456
0.01056441 0.88771451 0.075997 0.78570284 0.11683626 0.55915119
0.72460224 0.84546863 0.97696043 0.95954342]
mergeSort: 6.461143493652344e-05
[0.06080247 0.97226885 0.08120764 0.90180005 0.53774488 0.02728784
0.74676361 0.47729443 0.68164333 0.34093357 0.76826365 0.20799531
0.32330946 0.44553775 0.24034825 0.14475167]
quickSort1 (regular): 8.463859558105469e-05
[0.61681128 0.34406451 0.35742449 0.72263301 0.78181693 0.84918921
0.7105952 0.68502255 0.18233543 0.83174649 0.21213378 0.01563845
0.28901365 0.20703098 0.42555737 0.89415733]
quickSort2 (insertion): 4.100799560546875e-05
[0.80571799 0.35507949 0.32938997 0.41585783 0.89386079 0.03978411
0.43935542 0.19078549 0.51362985 0.62681885 0.82572125 0.45698914
0.94383459 0.93965685 0.33965664 0.14166206]
quickSort3 (randomized): 9.655952453613281e-05
```

array size 2<sup>5</sup> or 32

```
[0.30364937 0.1973435 0.06208953 0.08638389 0.03617754 0.36720235
0.51303108 0.86342969 0.13914803 0.7579006 0.40473881 0.62243863
0.46935387 0.7061822 0.22430846 0.99069659 0.68318573 0.67660546
0.667472 0.40520771 0.29335565 0.86392601 0.52543484 0.24947542
0.67643646 0.74043751 0.07726929 0.25462728 0.26256283 0.40029324
0.83272432 0.73532504]
insertionSort: 8.225440979003906e-05
[0.65455473 0.75215795 0.12493713 0.52384644 0.35542008 0.07935901
0.59521353 0.42911016 0.17383052 0.07304445 0.23509977 0.91722602
```

```

0.45050676 0.58939935 0.10540098 0.16208094 0.39204977 0.71202362
0.963866 0.00995557 0.45983821 0.04379454 0.29290502 0.80216949
0.72282107 0.98144531 0.12891382 0.92053843 0.45384077 0.13885152
0.57757041 0.95984302]
mergeSort: 0.00011610984802246094
[0.72185137 0.64508633 0.01117345 0.13088456 0.42577171 0.31241294
0.57329254 0.27747307 0.4286411 0.21884497 0.42755922 0.66472478
0.07483758 0.38117553 0.50174872 0.97247508 0.8909193 0.85741539
0.55852882 0.17865767 0.7349137 0.73307843 0.99170078 0.01564402
0.57464054 0.05913125 0.98233741 0.06460166 0.8350852 0.28238776
0.79051027 0.03873384]
quickSort1 (regular): 9.107589721679688e-05
[0.1455362 0.27723384 0.59065791 0.38461532 0.072633 0.02705062
0.63424198 0.11269867 0.39826285 0.55393982 0.51155818 0.9551077
0.48640991 0.853967 0.86330474 0.69747292 0.07212373 0.94904371
0.208937 0.70350814 0.53783352 0.04187475 0.15329784 0.15772938
0.095788 0.34589151 0.39877977 0.63678017 0.11793845 0.72658013
0.37338712 0.87470997]
quickSort2 (insertion): 8.893013000488281e-05
[0.17148676 0.95139784 0.17793602 0.10885965 0.78655727 0.32122009
0.44444712 0.35124919 0.64018619 0.41381304 0.75678005 0.07307446
0.14712944 0.29091573 0.91027798 0.01151088 0.92359891 0.91217174
0.77573222 0.8891125 0.22098044 0.62339402 0.78644731 0.02799587
0.87960358 0.49823065 0.31508905 0.75352745 0.74183618 0.38678665
0.25817428 0.65544563]
quickSort3 (randomized): 0.00014829635620117188

array size 2^ 6 or 64
[0.00991955 0.88308061 0.08752979 0.41892124 0.56150711 0.42597721
0.2136592 0.44233647 0.18274234 0.04586578 0.83491681 0.41143991
0.76854853 0.33629267 0.20583767 0.14847342 0.45486912 0.7592408
0.25625834 0.00714277 0.63085028 0.5117506 0.22145408 0.59332736
0.75895139 0.02489854 0.62410776 0.64863838 0.7018007 0.74380987
0.46018 0.74822319 0.5097038 0.34994833 0.6106818 0.16191316
0.1785748 0.76239573 0.97865299 0.94865662 0.93593095 0.73683116
0.12528471 0.95951095 0.34098439 0.1878417 0.62757874 0.69461004
0.22749473 0.52176653 0.05381523 0.74293602 0.66007651 0.96155467
0.71435735 0.68746472 0.86325858 0.70493394 0.29540706 0.36082608
0.60106836 0.65639534 0.14321023 0.05922197]

```

insertionSort: 0.0003287792205810547

[0.18319446 0.11783666 0.5893844 0.69145024 0.3434852 0.35297757  
0.51255666 0.08653214 0.19103613 0.48498873 0.6342799 0.38844447  
0.92983356 0.43247486 0.23360876 0.91919342 0.73734919 0.31333692  
0.37756681 0.57386884 0.11911917 0.34750139 0.18749522 0.22747589  
0.98101948 0.74252766 0.63204292 0.67288907 0.01859275 0.34213081  
0.34757528 0.35106708 0.83110848 0.13399407 0.68955172 0.3023671  
0.93901172 0.78986764 0.38714668 0.26018679 0.93142586 0.76934052  
0.97651207 0.24887122 0.08511872 0.57165507 0.20675084 0.26069491  
0.43054446 0.44767309 0.02842368 0.49256347 0.20460695 0.7622632  
0.70119075 0.97150258 0.08479234 0.18183057 0.22946907 0.64860203  
0.23690683 0.55521436 0.6988466 0.7813876 ]

mergeSort: 0.0002422332763671875

[0.89489327 0.17655578 0.3544316 0.16986993 0.37451662 0.82918677  
0.67270605 0.21448975 0.3003883 0.86664294 0.16598299 0.19144045  
0.0272718 0.94863165 0.45902779 0.13140118 0.06853222 0.23746524  
0.85988268 0.7291623 0.66409905 0.10240307 0.5628969 0.30673614  
0.4770148 0.05339204 0.85747594 0.04584692 0.32757202 0.30969994  
0.39073842 0.279428 0.0250045 0.41966421 0.73235904 0.44108922  
0.64495296 0.58889911 0.61109209 0.45250168 0.86540041 0.65652942  
0.3875784 0.04315887 0.68039805 0.51977357 0.47602461 0.71424379  
0.39633482 0.62757589 0.60626876 0.98372054 0.77022737 0.56537198  
0.62293858 0.26322361 0.20273995 0.94707618 0.10488153 0.09617589  
0.23478562 0.84681417 0.71819151 0.21916096]

quickSort1 (regular): 0.0001800060272216797

[0.08623506 0.39500989 0.06122162 0.6689367 0.50540188 0.0446297  
0.03700365 0.78093701 0.93944082 0.24207537 0.23796173 0.28283783  
0.64959792 0.39002825 0.37251883 0.52807401 0.78707085 0.48629458  
0.7011697 0.35758524 0.23823407 0.66881609 0.18388921 0.07915112  
0.96757075 0.01047226 0.98459878 0.28180048 0.06443509 0.9037452  
0.87867714 0.33049226 0.78564208 0.88111513 0.38909705 0.12108799  
0.17779562 0.03722872 0.36216805 0.78660833 0.63950082 0.4490979  
0.90611985 0.54901155 0.99390954 0.90931471 0.66191714 0.14869444  
0.10192498 0.10319395 0.64498446 0.39133596 0.1373728 0.60927042  
0.56698449 0.49528309 0.68446172 0.42834077 0.05488396 0.08221408  
0.9514 0.01592391 0.61613551 0.58948727]

quickSort2 (insertion): 0.00023055076599121094

[0.66239888 0.39379856 0.00154159 0.99921051 0.97326469 0.3206666  
0.19098924 0.29843173 0.6592517 0.1646873 0.55048344 0.93042583

```
0.72448596 0.69548238 0.08278457 0.51140747 0.64824544 0.55874207
0.28550517 0.62784072 0.43088096 0.34025994 0.14456472 0.47675868
0.02299157 0.45910232 0.10823091 0.05766484 0.44155356 0.88009551
0.7541641 0.64837488 0.30356078 0.85640058 0.59106285 0.40772572
0.31519997 0.0439059 0.86004606 0.3589562 0.54080048 0.40382089
0.30693919 0.93320191 0.01664039 0.22324237 0.71997382 0.20746558
0.58407905 0.74947156 0.12871359 0.90600901 0.57060081 0.05241071
0.9468337 0.96912417 0.12519216 0.3447803 0.05283216 0.6083471
0.00725435 0.38120484 0.27154161 0.41964553]
quickSort3 (randomized): 0.000331878662109375
```

array size  $2^7$  or 128

```
[0.56783582 0.47441114 0.31557074 0.97100932 0.34599261 0.83553442
0.09535086 0.4645292 0.24567481 0.57863022 0.24902072 0.33177366
0.69635297 0.43265408 0.15621026 0.93386051 0.30520435 0.44399479
0.96944396 0.40502123 0.37874795 0.10693983 0.27408219 0.20403198
0.33426416 0.39763834 0.08801784 0.42276224 0.54627013 0.71223235
0.29556213 0.11682652 0.49811062 0.06476191 0.82969456 0.25422036
0.09792771 0.99122869 0.94963436 0.77879881 0.04494606 0.97049385
0.9589698 0.87344316 0.00304989 0.32650145 0.51012294 0.76030674
0.97996828 0.03808713 0.77929689 0.93506281 0.42910769 0.38474242
0.70959505 0.97751482 0.28721766 0.11401155 0.47747694 0.33228647
0.73822563 0.16439072 0.44738836 0.840727 0.96347072 0.6328006
0.78243906 0.95958165 0.23360359 0.17116284 0.53606436 0.18528481
0.29646917 0.4664975 0.97407592 0.12044742 0.74973743 0.59021842
0.53151414 0.92387686 0.5558437 0.84816445 0.1266886 0.24421469
0.10440885 0.32863303 0.48841373 0.32723242 0.53175768 0.93357139
0.78442522 0.65562912 0.86627465 0.56814788 0.60752781 0.48040819
0.93911979 0.75224967 0.86481875 0.16220407 0.50475533 0.21728631
0.44464078 0.82645534 0.95993313 0.65294272 0.11483392 0.48438719
0.42879511 0.39360151 0.21784986 0.16348126 0.55728377 0.41001878
0.53337635 0.4425449 0.30800304 0.80358103 0.36368708 0.23598141
0.37844666 0.53478208 0.08644535 0.34390239 0.86771885 0.05614963
0.17169321 0.06028327]
```

insertionSort: 0.0014417171478271484

```
[0.9438023 0.66033601 0.81039763 0.26158862 0.38371194 0.32572395
0.8478772 0.89049092 0.87653926 0.45372823 0.9322806 0.49257163
0.02696282 0.07803164 0.97785093 0.55694038 0.61421742 0.24545076
0.5872329 0.24941089 0.81021791 0.46802655 0.53597805 0.76311341
```

```
0.46358833 0.94676011 0.37924278 0.42153771 0.76470744 0.3098515
0.12915666 0.55834407 0.88868572 0.84816079 0.97778116 0.63184597
0.71582145 0.49391028 0.08023931 0.00401298 0.10041766 0.9508161
0.06325336 0.1376315 0.94046776 0.04369744 0.15372584 0.94138506
0.05414281 0.19030657 0.37189627 0.32306608 0.44084454 0.80112548
0.21439444 0.87864729 0.13015518 0.98546352 0.98432869 0.19077694
0.89558682 0.80255167 0.97242961 0.16516458 0.14879728 0.22302835
0.41852997 0.20581445 0.12958511 0.0598594 0.73897795 0.86953982
0.32557799 0.24364158 0.84461415 0.23160884 0.62724464 0.9595964
0.71637099 0.05001877 0.96644253 0.88158018 0.43958373 0.84775098
0.62997821 0.48944146 0.15746024 0.43593017 0.4241149 0.21369772
0.20395145 0.60054403 0.64993776 0.62260404 0.79848852 0.29961305
0.93380341 0.9907162 0.59048443 0.80444579 0.01607897 0.23438999
0.90493471 0.27451365 0.787923 0.21555182 0.17652972 0.18089402
0.64523164 0.96964031 0.56954029 0.16038083 0.65970176 0.65795522
0.28910125 0.1473924 0.60539209 0.54442624 0.23869069 0.87550614
0.68228923 0.30907979 0.59854802 0.58407561 0.67137802 0.74781226
0.53924035 0.53833283]
mergeSort: 0.0005214214324951172
[0.47592955 0.48725905 0.00207956 0.84818364 0.94080486 0.47187208
0.69160617 0.84794746 0.04983197 0.17035823 0.90190911 0.89743691
0.98800468 0.28389276 0.63686774 0.7044812 0.94881958 0.8635399
0.19348216 0.5141763 0.27290104 0.96521769 0.5977213 0.2087828
0.97607288 0.58997472 0.8591532 0.01861718 0.32615059 0.79210118
0.30568683 0.15842519 0.50235343 0.25650477 0.51971442 0.77419043
0.47385672 0.006606 0.31557296 0.61705346 0.3411869 0.57683419
0.91910914 0.10203289 0.92689565 0.7031426 0.60801103 0.98441755
0.08107164 0.90576315 0.52894171 0.94578043 0.38251521 0.55769046
0.27989113 0.05141997 0.77448779 0.59063746 0.22268686 0.13854766
0.79910746 0.40377898 0.87330433 0.86224682 0.23313487 0.57310402
0.23857177 0.72630986 0.90888882 0.03256048 0.65277497 0.9574679
0.58450369 0.3188031 0.64867485 0.02499155 0.56055845 0.65148804
0.94192236 0.42335741 0.66247856 0.9955149 0.16952027 0.008451
0.4464562 0.8475197 0.58088237 0.849356 0.80965478 0.68366696
0.31317818 0.36554875 0.46056803 0.54564132 0.30406332 0.89428068
0.32980831 0.42864096 0.49302938 0.57961502 0.45120509 0.10452663
0.52026188 0.59226438 0.26640373 0.35311336 0.85375567 0.9543197
0.8122153 0.31045682 0.23582725 0.31964362 0.95293318 0.62612543
0.08423989 0.96310764 0.53160949 0.8339732 0.4668057 0.3351244
```

```
0.18850079 0.53586735 0.04044118 0.35753374 0.20042052 0.86321429
0.13100274 0.26397102]
quickSort1 (regular): 0.0004253387451171875
[0.88776734 0.6673598 0.30673405 0.22548189 0.99085156 0.62436187
0.29407381 0.46877196 0.88915024 0.75811569 0.02879588 0.88923739
0.65256217 0.27976882 0.86781761 0.5998622 0.96399666 0.37501307
0.95941443 0.94281589 0.99766054 0.11183691 0.91269267 0.75493106
0.27693562 0.6021998 0.35507947 0.52969993 0.99025248 0.19866515
0.34495806 0.30487624 0.3979122 0.61564709 0.40193737 0.36418689
0.16738212 0.07192413 0.45947816 0.22069616 0.6415309 0.91257674
0.85759023 0.77392986 0.62606853 0.18018192 0.1789231 0.84462283
0.54057295 0.79002087 0.79129838 0.1194211 0.12151706 0.48067225
0.79728707 0.21057088 0.47560959 0.13787707 0.26737306 0.38771459
0.92757027 0.65040887 0.06103633 0.92174616 0.95627994 0.62818043
0.19515104 0.72344554 0.41495348 0.23673281 0.14666796 0.87897571
0.52877158 0.90708127 0.55454807 0.69885601 0.63388897 0.71422163
0.98253041 0.61322432 0.45096164 0.69082432 0.76146811 0.07089425
0.48588012 0.63219533 0.45954596 0.75587241 0.99435963 0.15406566
0.17232229 0.63690387 0.62397942 0.04600437 0.41512142 0.7708572
0.65724864 0.02087929 0.87118382 0.13347511 0.34345331 0.19206123
0.28284915 0.62759265 0.67074773 0.44196047 0.75595748 0.44500295
0.58308923 0.94617245 0.44483864 0.21227406 0.59646997 0.40760413
0.27300023 0.30102916 0.80848088 0.13402973 0.9769709 0.66832246
0.18852701 0.05512087 0.85647529 0.59068185 0.1985939 0.57378729
0.32000271 0.3373119 ]
quickSort2 (insertion): 0.00038623809814453125
[0.6839839 0.89522458 0.50518804 0.5831379 0.04740441 0.49275966
0.68316021 0.0269366 0.44906558 0.33573651 0.65666469 0.40260617
0.21224948 0.63346158 0.84251748 0.85409425 0.98981655 0.0255068
0.01493479 0.60060791 0.62295774 0.54035788 0.05052754 0.86156055
0.53661475 0.97073456 0.24958825 0.29104691 0.18736695 0.56752594
0.94745707 0.75007991 0.14097585 0.33739227 0.61240562 0.14702632
0.05225141 0.40009899 0.51232268 0.28689121 0.37474101 0.34277059
0.51604318 0.1671387 0.37722261 0.20868617 0.34600405 0.0315819
0.96627082 0.00168117 0.28444667 0.89010698 0.96442889 0.7855026
0.82831882 0.16418142 0.829357 0.012959 0.92420814 0.06748743
0.18968437 0.7933631 0.76667843 0.43378479 0.62170527 0.68103585
0.55524154 0.71223652 0.93905342 0.62422197 0.26007668 0.84939152
0.26563556 0.58838902 0.0509873 0.84812322 0.99410068 0.1351302
```

```
0.33865421 0.4623556 0.19003066 0.57473579 0.29819973 0.85697287
0.12010768 0.22266113 0.59455659 0.51220963 0.03804574 0.70674987
0.065364 0.6766974 0.92360051 0.45387738 0.19982954 0.28212102
0.31769012 0.83480606 0.93212364 0.18259743 0.53035325 0.8209421
0.05033625 0.50802408 0.66194322 0.2452007 0.3501069 0.26705076
0.37488328 0.60077618 0.57906618 0.72069075 0.65665625 0.42582525
0.62064481 0.04422201 0.23620604 0.90925765 0.87652942 0.95518956
0.21563376 0.59893914 0.26038163 0.68840684 0.92524899 0.37647887
0.37659977 0.09316998]
```

```
quickSort3 (randomized): 0.0006783008575439453
```

```
array size 2^ 8 or 256
```

```
[0.25880499 0.28992834 0.19932182 0.96505888 0.82396118 0.68911269
0.20692887 0.77260566 0.82646952 0.13791386 0.3569684 0.78730396
0.39448091 0.27923215 0.91775262 0.1356111 0.46081381 0.73930187
0.84946615 0.357555 0.10318239 0.94177359 0.87429093 0.69790108
0.52609528 0.32320645 0.53992323 0.51547288 0.45189347 0.80047868
0.3108803 0.59427991 0.51663588 0.28143713 0.45066269 0.89148874
0.17314919 0.42798543 0.51357924 0.8966007 0.01959089 0.86291219
0.29479737 0.54585407 0.81201733 0.84774911 0.12669237 0.57177432
0.00154947 0.35763307 0.79904679 0.06983414 0.6874329 0.29286726
0.07407381 0.4550276 0.48667364 0.35206256 0.54685925 0.67263295
0.54204679 0.54525697 0.49242403 0.99454748 0.35941888 0.64906304
0.10620866 0.85062122 0.91620211 0.82033572 0.12717085 0.25100378
0.94178262 0.81009219 0.24329833 0.27363865 0.5255688 0.89371527
0.37027297 0.98538311 0.99333353 0.02941627 0.89319883 0.75593907
0.27387214 0.80140454 0.04245028 0.9106836 0.97272336 0.82086076
0.40570303 0.34265812 0.66515444 0.67910236 0.46401543 0.40035768
0.25729727 0.40592391 0.5234432 0.93159578 0.40350086 0.61378706
0.40839622 0.53564339 0.12261052 0.30436948 0.90809684 0.85655887
0.3998627 0.20992751 0.20825265 0.78416128 0.14838506 0.46826611
0.69419718 0.27169447 0.17902309 0.40426271 0.73137488 0.26651371
0.24779828 0.39903145 0.6881022 0.7585264 0.22321034 0.72412084
0.23394301 0.62401144 0.71857514 0.77170891 0.5916733 0.92149146
0.31897628 0.95975701 0.25496082 0.14991663 0.24816145 0.1177784
0.72337702 0.69863546 0.81066056 0.39232754 0.79853584 0.81128894
0.81690657 0.8172978 0.67789196 0.38006563 0.37725166 0.61357012
0.61880058 0.37000678 0.16521266 0.73663963 0.57530239 0.52644665
0.07458344 0.64092668 0.80962928 0.14309234 0.25083695 0.15250957]
```



```
0.94478577 0.86077235 0.70865595 0.67032087 0.98580845 0.39432585
0.34546576 0.7075216 0.09523283 0.11575528 0.82686116 0.56838952
0.4151211 0.11196494 0.02806735 0.82686343 0.29977711 0.53572753
0.83842603 0.16573254 0.82313626 0.67853679 0.18261059 0.59552343
0.21324915 0.00579872 0.21570509 0.86897677 0.00560283 0.97823294
0.80022243 0.50337231 0.54034645 0.56191035 0.22311267 0.60617418
0.34227243 0.6483698 0.55099818 0.60052002 0.26712753 0.44313707
0.65426996 0.63419142 0.99088716 0.11105257 0.2017666 0.70741704
0.55462234 0.79675959 0.66043425 0.81140115 0.78416654 0.34515616
0.82427764 0.17778066 0.78466912 0.67314712 0.40844665 0.35818163
0.95221059 0.08866356 0.50725549 0.56227925 0.32472755 0.50306463
0.30249552 0.93170175 0.28472119 0.88754975 0.30352387 0.00463915
0.02996332 0.19203029 0.67344772 0.34526697 0.43569419 0.22459556
0.12252148 0.33457936 0.13228001 0.133966 0.40673645 0.19071066
0.84207265 0.86431048 0.38437688 0.56330437 0.60468232 0.15127041
0.70630266 0.5997482 0.93012065 0.62371942]
insertionSort: 0.005758047103881836
[0.65980159 0.81072189 0.41162959 0.92714081 0.34698098 0.01789851
0.65397476 0.37677237 0.70368908 0.1926707 0.05007002 0.44341674
0.30440372 0.45606634 0.34880985 0.25483289 0.73048495 0.24642056
0.36133424 0.34540779 0.35022619 0.01214529 0.67818967 0.82773681
0.54581279 0.04192273 0.56877509 0.85259262 0.05418059 0.38234683
0.83197931 0.72126439 0.41953303 0.83145682 0.45833472 0.78346984
0.39314164 0.68496965 0.40022035 0.54990141 0.28265295 0.7162509
0.87574774 0.10763693 0.66628474 0.86475915 0.11217784 0.24722872
0.44683165 0.63981317 0.50688311 0.14455823 0.85922791 0.02093667
0.38651085 0.68362123 0.7418566 0.93429256 0.39822531 0.3458005
0.2838811 0.35094255 0.23480965 0.440581 0.01209361 0.96468994
0.0017884 0.80301881 0.27064812 0.4984556 0.22843135 0.75652791
0.48076853 0.4767794 0.59277531 0.92129457 0.4466971 0.04427187
0.64654608 0.86980457 0.44198999 0.66495014 0.62498346 0.81257217
0.73572072 0.82990269 0.93196627 0.53099073 0.69329233 0.29580597
0.40095498 0.83242108 0.07723491 0.94911529 0.65862066 0.56270561
0.0854442 0.01756384 0.76561951 0.42289885 0.39951341 0.66491431
0.51105441 0.01903702 0.76163884 0.37654258 0.62510336 0.09905125
0.74866699 0.29090623 0.87328215 0.96905953 0.82161318 0.34592676
0.17589747 0.09883732 0.7132017 0.60960475 0.99222355 0.00100883
0.37350444 0.12928073 0.89937553 0.17412854 0.05906107 0.35775989
0.77121011 0.56400456 0.7245093 0.51821197 0.70731494 0.4936324
```

0.22293947 0.63251082 0.90431668 0.08959251 0.81791307 0.30070614  
0.67005849 0.85513056 0.14107736 0.62695078 0.25274156 0.88798272  
0.454766 0.5889295 0.76062862 0.69324052 0.05797581 0.18311977  
0.16193735 0.07553426 0.97241912 0.91750491 0.64799617 0.02711969  
0.89043266 0.02598992 0.95045413 0.04201294 0.37798488 0.85730942  
0.1883257 0.97437687 0.90909747 0.48042814 0.80811977 0.0998049  
0.82724432 0.2590502 0.80458629 0.60434339 0.38410202 0.69584817  
0.17524433 0.33607481 0.38527171 0.9979023 0.86800248 0.63992849  
0.0305028 0.49718908 0.41332235 0.26975067 0.57310063 0.1136275  
0.25281745 0.29069577 0.83016966 0.34614487 0.44890972 0.63157274  
0.43658389 0.34095829 0.64721806 0.93763881 0.69370548 0.90229952  
0.9690993 0.23411741 0.32631434 0.30887076 0.39261247 0.95676592  
0.91114059 0.01880127 0.71738351 0.81397756 0.46888176 0.73050935  
0.3092394 0.6295828 0.37457757 0.10452607 0.89631744 0.49385291  
0.53834284 0.79511278 0.85936475 0.00312514 0.39276168 0.32185199  
0.19352401 0.86004419 0.91841089 0.54046879 0.4570307 0.45097407  
0.54568498 0.04147335 0.67548816 0.72188661 0.58193978 0.08949185  
0.89538012 0.03068928 0.12776547 0.97299506 0.47792581 0.16928528  
0.13371338 0.98202725 0.1787688 0.49764048 0.21520612 0.78086364  
0.42593983 0.90545474 0.45535664 0.20940693 0.36582405 0.54105447  
0.85013775 0.94129168 0.15514927 0.23453462]

mergeSort: 0.0011677742004394531

[2.01879480e-01 4.46563733e-01 9.21059740e-01 4.24423930e-01  
5.36243342e-01 6.44521399e-02 8.17874135e-01 8.36436879e-01  
4.40694038e-01 9.29541520e-01 5.58110294e-01 9.70822137e-01  
6.70157395e-01 4.62484240e-01 3.88664485e-01 7.46785111e-01  
7.93953731e-01 5.33064541e-01 2.54833994e-02 2.61754532e-01  
7.05020745e-01 7.63880158e-01 8.18970267e-01 6.42270946e-01  
2.93955029e-01 2.12218521e-01 9.77389507e-01 4.10969115e-01  
8.04662018e-01 6.51265456e-01 8.27082020e-01 6.75200889e-01  
5.03435250e-01 7.51213178e-01 8.34340682e-01 8.25290875e-01  
9.92760201e-01 7.12870490e-01 6.33418183e-02 6.49970115e-01  
1.09303306e-01 4.14791283e-01 3.22507220e-01 8.68789960e-01  
4.73940696e-02 9.01490505e-01 4.51482957e-01 2.95141850e-01  
3.18124952e-01 5.39920942e-01 9.05922113e-01 4.41856215e-01  
3.58701768e-03 1.09639410e-01 9.43852558e-01 1.13482631e-02  
5.83262615e-01 7.29808149e-01 4.03261558e-02 5.18669237e-01  
7.57601262e-01 4.43491379e-01 3.21305287e-01 7.90126040e-01  
6.87080638e-01 7.51155172e-01 5.19561908e-01 7.35420328e-01

7.63436234e-02	1.56443191e-01	2.65598656e-01	9.17254369e-01
1.91746772e-01	8.45837839e-01	5.94023320e-01	2.98221364e-01
5.13446105e-01	4.17163602e-01	3.49925806e-01	6.37613629e-01
8.10372982e-01	2.77578848e-01	7.27294509e-01	8.55566143e-01
6.72554534e-01	5.92266394e-01	9.90870983e-01	7.85465131e-01
4.69177098e-01	2.77790534e-01	5.62522372e-01	4.07595595e-01
8.47323316e-01	1.42977776e-01	6.60809862e-01	1.89778113e-01
3.77407999e-01	9.18658504e-02	4.56061515e-01	9.93695296e-01
8.51173552e-01	8.41774612e-02	5.27042047e-03	2.32471456e-01
8.89727772e-01	3.59722053e-01	6.00646598e-01	3.52171309e-01
8.46760402e-01	8.90686955e-02	7.32009745e-01	3.70711365e-01
3.42664256e-01	3.58193455e-01	4.96698956e-02	5.27968065e-01
1.17086997e-02	1.46045590e-01	5.37753245e-01	3.00051077e-01
5.69390776e-01	7.30305229e-01	8.68776452e-02	8.29464153e-01
2.36829305e-01	8.51595027e-01	7.40569877e-01	8.86218295e-02
9.31180481e-01	3.06185823e-01	7.66515593e-01	9.13168324e-02
9.26780619e-01	4.62218271e-01	2.01082181e-01	5.18303364e-01
9.78512640e-01	5.69734814e-01	5.93124105e-01	6.62728261e-01
6.03582591e-01	6.53890828e-01	9.63944325e-01	1.33622058e-01
9.45813720e-02	4.68741742e-01	8.64386916e-01	9.21986977e-02
8.60406446e-01	2.09178653e-01	7.82022802e-01	6.23576487e-02
1.81761363e-01	3.85677540e-01	5.20633977e-01	9.80200711e-01
3.54605531e-02	9.81794669e-01	8.92892690e-02	8.08899689e-01
7.81737010e-01	4.27215199e-01	5.73885659e-01	6.96524916e-01
3.67108282e-01	9.03186645e-01	6.15798810e-01	9.55300396e-01
3.32913996e-01	2.12759465e-03	5.38997964e-01	6.69166395e-02
6.95112651e-03	1.61811419e-01	8.36313722e-01	8.55006358e-01
2.01341417e-01	2.65171595e-01	1.52556241e-01	3.83864621e-02
7.94513802e-01	9.92617436e-01	3.90702471e-01	1.50955040e-01
4.76309832e-03	4.72592673e-01	2.69903702e-01	7.69237442e-01
1.66344956e-01	8.55439873e-02	6.63196244e-01	1.31341189e-01
8.95613768e-01	2.49526668e-01	5.34396026e-02	5.19229487e-01
3.26674096e-01	1.69619955e-01	6.62933972e-01	4.11337730e-01
3.64636635e-01	2.77876283e-01	2.12389879e-01	3.83378127e-02
5.92192329e-01	1.35321529e-01	9.08100653e-01	6.56316324e-01
6.30619962e-01	9.99946564e-01	7.68358536e-01	8.12291831e-01
5.91620345e-01	9.54101857e-01	2.37429254e-01	7.04542141e-01
7.05591549e-01	7.89987069e-01	3.93605447e-01	6.57661326e-01
3.75669015e-01	3.42439892e-01	5.57322327e-01	5.41905535e-01

```
8.05586389e-01 9.06667539e-01 4.53575764e-01 1.56194626e-01
7.46487676e-01 9.42471156e-01 7.07456779e-01 9.33793358e-02
7.27975995e-02 7.81747917e-01 5.84630681e-01 3.82557835e-01
2.32093535e-01 1.21945223e-01 5.24211950e-01 4.18336913e-01
9.88655739e-01 4.63808407e-01 5.50396525e-02 6.72561948e-01
5.64420538e-01 2.01336022e-01 8.42718067e-01 8.87875252e-01
4.33455349e-01 7.15096782e-01 5.37161828e-02 7.19282899e-03
2.41484210e-04 3.76571026e-01 7.38118034e-01 2.04110529e-01]
quickSort1 (regular): 0.0009338855743408203
[0.78376014 0.27074988 0.59440387 0.55137777 0.24987563 0.9914318
0.26368389 0.69436665 0.10738493 0.68879762 0.71398042 0.38050382
0.79686911 0.46014403 0.5766902 0.42882501 0.23535681 0.73512051
0.1691552 0.01236277 0.39201257 0.14977264 0.42895947 0.51966379
0.67385299 0.26439598 0.93211532 0.11485756 0.47339083 0.41954048
0.32140734 0.47367135 0.27349308 0.94787523 0.74280447 0.98000342
0.86635413 0.51131575 0.39312376 0.08930824 0.06775638 0.03751822
0.60719669 0.7057073 0.71365773 0.15848252 0.00807186 0.71529673
0.92747982 0.32245549 0.29691391 0.45602959 0.65336011 0.58637492
0.57337673 0.98489094 0.44804797 0.56773728 0.25325861 0.61624218
0.07180796 0.88524717 0.29762349 0.23426036 0.28511028 0.14007607
0.96628931 0.6795294 0.8675898 0.76918571 0.46812424 0.17152075
0.34216958 0.87170033 0.63392292 0.87417283 0.17516837 0.24163842
0.0129517 0.41801753 0.4745494 0.61189513 0.047883 0.69669643
0.79601938 0.04584425 0.09175215 0.16163847 0.15250236 0.27232227
0.07662246 0.13125164 0.67660193 0.41257406 0.41880032 0.66309891
0.62453192 0.43876817 0.64044906 0.95225497 0.98271246 0.94558353
0.26966176 0.13638284 0.56726747 0.86347822 0.19958132 0.34934988
0.69626045 0.9004698 0.96630237 0.39373629 0.34809958 0.09968679
0.97844573 0.40992041 0.29056604 0.42603161 0.2249189 0.54812577
0.12353549 0.3857666 0.58728604 0.0973012 0.95069935 0.54002991
0.63363307 0.66174493 0.61986764 0.07071897 0.68483291 0.08162442
0.03644664 0.26010721 0.57089298 0.81148431 0.08624696 0.58434991
0.63099909 0.95699856 0.54499976 0.55560582 0.67885119 0.05577725
0.22777175 0.88302426 0.53195009 0.6046226 0.90418828 0.90844234
0.42134035 0.49372995 0.64821235 0.07560515 0.61616987 0.5747483
0.57373183 0.05035067 0.51447618 0.09223926 0.6056921 0.75040007
0.1266437 0.89520134 0.06635234 0.26281324 0.30143352 0.9593394
0.86509644 0.11721797 0.17744331 0.25755494 0.47258263 0.95312578
0.46033689 0.22270946 0.72375322 0.72204235 0.31865847 0.84177091]
```

0.66575281	0.07688299	0.24687759	0.88887431	0.6696627	0.03274014
0.56793441	0.38514669	0.59712305	0.27522307	0.21305411	0.61985757
0.82363308	0.50340767	0.02996926	0.57906243	0.00315886	0.82968732
0.4013423	0.61286826	0.25694457	0.80503952	0.24651143	0.3916382
0.15004123	0.61047027	0.20968324	0.36328617	0.00295008	0.8406219
0.51343227	0.21221652	0.33553109	0.98611045	0.46433782	0.03716328
0.90278508	0.6655255	0.06985054	0.35797577	0.60458648	0.01393603
0.58027419	0.80997288	0.92461713	0.93702156	0.96061235	0.72293491
0.78758068	0.53738515	0.4165635	0.1194598	0.56265007	0.90380854
0.0744636	0.5346153	0.45747649	0.32395346	0.63693048	0.49039384
0.99636418	0.21372865	0.00502464	0.72102747	0.62408832	0.24704898
0.37893441	0.4613687	0.89882578	0.19960645	0.07385884	0.53171239
0.49078548	0.24694168	0.43010203	0.26115955]		
quickSort2 (insertion): 0.0008995532989501953					
[0.37127322	0.39814187	0.74004588	0.10782688	0.91525047	0.59250753
0.30819261	0.98435525	0.38865762	0.15376382	0.22474866	0.19354114
0.36800165	0.30777297	0.99150756	0.63442804	0.48484268	0.75451376
0.88643687	0.22489243	0.53716677	0.28439268	0.07314582	0.94339541
0.95886874	0.70287104	0.47479172	0.7386672	0.37444405	0.07049402
0.97577552	0.64771553	0.50405432	0.16925183	0.69862874	0.17658604
0.70962601	0.92071808	0.90294233	0.26872043	0.55595657	0.16232865
0.1197293	0.9421688	0.52285216	0.16954878	0.17458122	0.5120638
0.29282125	0.15245462	0.02159002	0.35889632	0.49249289	0.24634
0.08997015	0.86588219	0.79715369	0.9551575	0.49744898	0.22808479
0.38309777	0.40997327	0.40458783	0.56379171	0.81018808	0.14362313
0.84087448	0.48154388	0.18331936	0.94147314	0.3279883	0.82241294
0.87424348	0.00501663	0.74634088	0.06320661	0.8988045	0.2274353
0.99432645	0.33320226	0.12428034	0.13580827	0.2092915	0.83753498
0.97862029	0.02178884	0.5711406	0.18795947	0.88441815	0.89251023
0.23526116	0.07432217	0.11871506	0.61031191	0.29716475	0.68676065
0.99486456	0.46959471	0.75201053	0.36799183	0.46824061	0.95308173
0.51977717	0.36778702	0.96494233	0.89752546	0.13976208	0.94955568
0.20820388	0.23393578	0.9355142	0.98708136	0.56532945	0.07443508
0.78298978	0.16657886	0.20089541	0.75192139	0.38617783	0.43398711
0.29488161	0.01566225	0.09055177	0.23523749	0.38834505	0.4225632
0.69279337	0.64464515	0.77420984	0.58524679	0.290157	0.8611936
0.65379125	0.81796703	0.89592052	0.13653276	0.18779385	0.18588884
0.79140151	0.10720515	0.40812917	0.18332409	0.48150503	0.84500536
0.75060211	0.60749065	0.10114154	0.9381041	0.08974915	0.27472061

```
0.50103398 0.16762052 0.22315978 0.08712242 0.42724091 0.45500827
0.27604143 0.47180249 0.74416903 0.97064871 0.6667466 0.59032345
0.55597189 0.18790762 0.68319342 0.66428584 0.20651152 0.72015391
0.42973698 0.98342655 0.23695642 0.31885581 0.37721398 0.19150648
0.07344219 0.11054835 0.65613169 0.87715438 0.64994228 0.17416504
0.40389957 0.01734749 0.42228058 0.19139648 0.56598397 0.14449293
0.64335494 0.37984142 0.01218496 0.67770987 0.31955219 0.26009246
0.68310751 0.8388198 0.16357162 0.18026303 0.24731441 0.19906957
0.65750542 0.14048653 0.50555153 0.8930567 0.10801535 0.87046961
0.5941195 0.05987159 0.69561887 0.40768915 0.37621545 0.60609331
0.41794661 0.80459365 0.71422775 0.88873593 0.07398071 0.90342365
0.90590457 0.82486362 0.26494197 0.79710624 0.87681612 0.93723181
0.40250103 0.05193704 0.31457126 0.28046718 0.06827023 0.13753299
0.30621256 0.83112983 0.23373918 0.65311798 0.63469341 0.45347783
0.04131896 0.60098276 0.99772586 0.19790665 0.8193422 0.10654056
0.43411975 0.74022991 0.84652821 0.17631047 0.78117696 0.74127714
0.10975534 0.11653674 0.29936791 0.210919 0.3313071 0.82368711
0.21624249 0.25659101 0.64347235 0.35447817]
quickSort3 (randomized): 0.0014774799346923828
```

array size  $2^9$  or 512

```
[5.15061334e-01 4.50135769e-02 6.43916581e-01 4.60950979e-01
8.61855730e-01 6.51271219e-01 2.48971887e-01 9.82080817e-01
5.72037282e-01 3.25703967e-01 7.68415710e-01 6.04846618e-02
8.17967780e-01 2.26233941e-01 5.78952253e-01 6.98235399e-01
5.14791369e-01 2.18264768e-03 1.09758594e-01 3.28165656e-01
4.29734941e-01 9.60085471e-01 5.24566441e-01 8.38536549e-01
2.10477335e-02 5.61429405e-01 8.12208177e-01 4.47799896e-01
9.75630017e-01 4.90546652e-01 6.98174750e-01 6.96464719e-01
7.40512606e-01 9.22150077e-01 7.52927691e-01 6.07091956e-01
7.07939473e-01 6.34759141e-01 3.81581801e-01 6.90188640e-01
3.10649146e-01 4.90266649e-01 1.63966602e-01 7.09491964e-01
2.06699694e-01 4.83956077e-01 2.06015451e-01 9.33489308e-01
3.22623396e-02 8.53191307e-01 7.81708170e-01 2.50200795e-01
4.95229362e-01 1.58118061e-01 5.99326938e-01 2.50755960e-01
2.76738499e-01 1.04400255e-01 4.82444397e-01 1.83356585e-01
7.65324774e-01 2.31178385e-01 9.18535720e-01 9.63068645e-01
9.73319302e-03 5.68589811e-01 3.86069908e-01 8.36782872e-01
1.67649245e-01 7.71610228e-03 6.29328540e-01 2.14564706e-01]
```

9.52256947e-02	7.81667473e-01	1.04481657e-01	2.45814601e-01
6.14634211e-01	9.51754712e-01	9.32316647e-01	4.77820407e-01
5.35893859e-01	7.59131959e-01	1.23255299e-01	9.85596736e-01
4.12113368e-01	2.97605133e-01	7.91660234e-01	8.51146948e-02
7.31003430e-01	3.20598934e-01	1.85184368e-02	6.92703165e-01
7.74654247e-01	7.17811177e-01	8.95853291e-01	6.74062681e-01
5.10459203e-01	3.01767238e-01	8.38817994e-02	3.26153787e-01
4.65446346e-01	7.66851025e-01	8.44238905e-01	8.31561144e-01
6.52772956e-01	9.17537806e-01	1.26877740e-01	1.68590333e-01
2.33033621e-01	4.49968584e-01	2.71937244e-01	5.40930934e-01
1.39932845e-01	2.84417699e-01	2.01697554e-01	7.81795568e-01
7.23577252e-01	8.84264853e-01	5.79994545e-01	1.49812964e-01
8.77116192e-01	4.55359323e-01	9.05772587e-01	7.59691494e-01
9.18483349e-01	7.66803228e-01	5.04978442e-01	5.64382333e-01
9.64920498e-01	5.83036820e-01	1.38772641e-01	8.74321624e-01
6.16165828e-01	3.85639194e-01	4.51489496e-01	1.42177612e-01
6.55574530e-01	3.72530868e-01	1.10331860e-01	8.00133549e-01
6.36507032e-02	1.10878578e-01	3.52175667e-01	5.85793537e-01
7.79171620e-01	5.35365344e-01	1.62437957e-01	2.73141661e-02
7.99641542e-01	8.12999629e-02	9.87702766e-01	7.74079227e-01
6.82883105e-02	7.90472897e-01	8.52797373e-01	3.12048320e-01
4.63004427e-01	1.81292313e-01	8.70579179e-01	1.94016964e-01
4.53774027e-01	6.81460681e-01	1.68852589e-01	1.25192809e-01
3.11702019e-01	2.95252761e-02	1.74236797e-01	1.77686273e-02
8.35767552e-01	6.58186701e-01	3.23726171e-01	2.21666810e-01
8.44096333e-01	7.76238314e-01	2.90130192e-01	7.52583731e-02
6.65600005e-01	2.33234741e-01	2.56612794e-01	6.12617511e-01
3.33462790e-01	9.04229801e-01	6.70576598e-01	2.31453447e-01
1.92106254e-01	4.62990119e-01	9.96985179e-01	5.70219087e-01
6.67074163e-01	5.88191285e-01	2.30919516e-01	6.73302964e-01
9.92301843e-01	2.99225227e-01	8.79424024e-01	4.24080475e-01
7.88030190e-01	8.93970754e-01	4.17412401e-01	5.64171413e-01
6.33927701e-01	9.19945231e-02	2.34790265e-01	2.23969930e-01
2.79392640e-01	8.16396452e-01	1.49368807e-01	6.90382065e-01
2.56656980e-01	1.67610218e-01	7.98774048e-01	9.95941771e-01
3.95720134e-02	3.34160746e-01	9.94513066e-01	9.06488283e-02
9.44193058e-02	2.37579930e-02	4.07115214e-01	2.03303371e-01
7.66238120e-01	9.22761450e-01	3.75232065e-01	6.42513711e-01
3.91650209e-01	4.63461771e-01	6.42936858e-01	9.58956967e-01

2.59019192e-01	5.83635894e-01	2.53427018e-01	8.17657713e-01
7.07540447e-01	8.80525713e-01	7.29180187e-01	3.30779558e-01
7.57368918e-01	7.52461577e-01	4.30224779e-01	3.96099861e-01
7.02567930e-01	8.32622057e-01	2.44243379e-01	1.66416676e-01
1.01064598e-01	7.74536834e-01	2.76461591e-01	4.06300185e-01
2.89920091e-01	9.71392956e-01	7.10837267e-02	5.31684977e-01
7.39622682e-03	3.88410267e-01	5.05793841e-02	1.66843528e-01
6.80793434e-01	3.98790233e-01	7.81699644e-01	3.84142107e-01
1.14979314e-01	6.39803533e-01	1.91613369e-01	3.54869514e-01
5.50959357e-01	5.50189579e-01	5.48528241e-01	6.58436306e-01
6.38992546e-01	8.78172786e-01	9.46493878e-01	7.47341442e-01
8.13776229e-01	7.88908305e-01	8.02945514e-01	6.67609496e-01
5.06226832e-01	8.18427967e-01	7.71947579e-01	7.46688955e-01
4.62408051e-01	8.20927596e-01	7.43339266e-01	8.11770998e-01
3.61987258e-01	6.62946749e-01	7.11845584e-01	9.43202370e-01
5.92854071e-01	2.20405418e-01	6.91084290e-01	5.45254294e-01
2.92244315e-01	7.69585839e-01	5.50658890e-01	2.39059581e-01
1.25850845e-01	6.60834769e-01	8.05805058e-01	1.45388682e-01
1.13555514e-01	1.46393180e-02	6.23577075e-01	8.35294061e-02
2.35635666e-01	3.12792398e-01	5.63568344e-01	4.71938165e-01
7.67393317e-01	8.70538474e-01	4.10000870e-01	6.60277383e-01
5.30184654e-01	7.22105111e-01	2.82916855e-02	6.49453224e-01
6.47380908e-01	9.27640244e-01	2.54216927e-01	2.45087558e-01
4.72117981e-01	5.23783025e-01	2.62921517e-01	9.79354522e-02
6.11096578e-01	9.01963275e-01	9.37984536e-01	7.33469830e-01
5.92505514e-01	2.14272249e-01	2.87454030e-01	2.18232296e-01
8.87051567e-02	2.50941502e-01	7.85215307e-01	8.50967632e-01
4.10066400e-01	7.24000371e-02	5.71280935e-01	8.51282408e-01
9.57900600e-01	2.38999750e-01	7.74730169e-01	6.85017999e-02
3.00093635e-01	3.11198858e-02	9.34572605e-01	1.78884330e-01
8.14836977e-01	2.99551020e-01	1.63475308e-01	3.31714302e-01
6.85616362e-01	2.24891278e-01	6.71182515e-01	1.12106166e-01
1.92316650e-01	6.70968137e-01	3.50656868e-01	4.97785775e-01
6.95728845e-04	3.81105080e-01	2.78871176e-02	3.62134705e-01
7.25772820e-01	8.32848215e-01	8.31746425e-01	1.02794935e-01
2.64770326e-01	1.50490856e-01	6.87774235e-01	3.67515785e-01
7.60723515e-01	4.10528623e-01	5.93014384e-01	1.05012997e-01
7.22006385e-01	8.32347882e-01	7.81867578e-01	6.62837113e-01
1.28515216e-01	3.51143586e-01	5.35626458e-02	6.66735540e-01



8.18304302e-01	9.55344599e-01	4.21594800e-01	7.45420136e-01
7.70707380e-01	3.05038967e-01	2.56792168e-01	3.35624514e-01
6.00838797e-02	4.74307134e-01	3.51828781e-02	9.91869783e-01
6.31966448e-01	1.49439985e-01	9.77278483e-01	1.77717695e-01
9.85764143e-01	1.04410581e-01	7.48689925e-01	2.08659697e-01
3.77763330e-01	2.56980553e-01	7.25576611e-01	4.40217627e-01
9.15962423e-01	5.46399348e-01	2.69248726e-01	5.17555433e-02
9.24935982e-01	7.57189221e-01	3.48318668e-01	1.17197252e-01
6.55776251e-01	9.21184945e-01	3.11782974e-01	3.84816906e-01
2.15688589e-01	3.11950700e-01	9.24697334e-01	1.70359828e-01
3.76651537e-01	9.72314092e-01	8.28043466e-01	3.91564730e-01
4.68600151e-01	8.69760017e-01	5.32032794e-01	5.20170676e-01
6.35554831e-02	2.32524413e-01	4.25739304e-01	1.90998993e-01
8.38996031e-01	2.77051066e-01	7.71502941e-01	1.25442190e-01
6.09742571e-01	3.28568147e-01	4.84024673e-01	9.54665920e-01
4.08607505e-01	8.45345855e-01	5.71012826e-01	9.19244605e-01
2.78162686e-01	3.88111044e-01	3.72105845e-01	2.93113812e-01
9.79883560e-01	2.29513497e-01	1.96007013e-01	1.29823439e-01
2.09264913e-01	6.59788666e-01	1.37001324e-01	1.23662639e-02
1.52481811e-01	1.21789832e-01	2.84774809e-01	9.30830744e-01
8.55168458e-01	7.84530651e-02	5.10971607e-01	7.27910170e-01
6.61640183e-03	7.04071803e-01	7.67135595e-01	5.63915187e-03
2.26584803e-01	4.28763199e-01	3.03547215e-01	7.55201188e-02
4.81692776e-02	4.65521970e-01	3.91092310e-01	9.34094915e-02
3.78986673e-01	2.77039423e-01	5.42633323e-01	9.36780173e-01
1.80712547e-01	1.41505995e-01	6.86008367e-01	4.06437224e-01
6.34776490e-01	2.46395534e-01	7.15612554e-01	4.28042830e-01
2.20798639e-01	1.16582461e-01	9.71157661e-01	2.50733018e-01
5.10297036e-01	9.47090284e-03	3.64676825e-01	5.74365075e-01
1.76557280e-01	8.32650396e-01	2.76488008e-01	9.20277878e-02
3.35757533e-03	4.51492173e-01	5.86787934e-01	7.18112608e-01
3.74026224e-01	7.19662352e-02	4.37348217e-01	8.28450785e-01]

insertionSort: 0.023502111434936523

[6.21476974e-01	9.00764487e-01	2.97232366e-01	3.22285134e-01
5.54787378e-01	4.76359296e-01	2.87180464e-01	6.98559413e-01
5.26502971e-01	9.63170968e-01	5.01365458e-01	2.33576084e-01
4.61708742e-02	7.93916068e-01	2.88272893e-02	3.86971314e-01
1.50156893e-01	5.27602714e-01	7.79642832e-01	5.07603083e-01
4.51770857e-01	4.71364139e-01	5.06196908e-01	3.49094503e-01

1.39089083e-01	7.50736163e-02	1.70131404e-01	5.92357526e-01
1.15870316e-01	5.95808612e-01	4.43077429e-01	3.77981244e-01
5.38643758e-01	9.22841786e-01	4.95740599e-01	6.05536351e-01
2.55831590e-01	9.13090992e-01	1.89348092e-01	6.80985429e-01
6.81297834e-01	6.10124942e-01	7.36181423e-01	6.03747493e-02
1.69820694e-01	7.31383425e-01	5.77448441e-01	4.72932930e-01
9.03101880e-01	8.36454451e-01	7.77197491e-01	5.88627218e-01
7.21236240e-01	5.49621482e-01	9.94443366e-01	7.41452177e-01
9.09930185e-01	6.29739117e-01	1.77117010e-01	3.98986102e-01
5.45031523e-01	4.59962303e-01	3.04965981e-01	8.25323080e-01
5.04088015e-02	1.67132345e-01	8.74820142e-01	9.81821876e-01
3.12102553e-01	8.48118057e-01	5.30116191e-01	5.02674413e-01
2.23151947e-01	9.24439360e-01	6.17791397e-01	4.37759798e-01
4.52270992e-01	9.38757027e-01	8.73917797e-01	6.65124850e-01
8.17714293e-01	3.80449551e-01	8.38366159e-02	7.93456135e-01
7.79980082e-01	1.41701919e-01	9.21306946e-02	1.97821452e-01
9.26388782e-01	5.84696257e-01	4.50495300e-01	5.98821559e-01
3.26193794e-01	4.35174102e-01	5.63804540e-01	4.37191746e-01
1.58461638e-01	5.03505323e-01	4.63550565e-01	8.08501900e-02
3.79425112e-01	2.45709237e-01	8.03486191e-01	8.27180358e-01
5.04768986e-01	1.20704218e-02	6.31379350e-01	4.27522324e-01
8.76948235e-01	8.71067008e-01	8.84168948e-01	2.59866972e-01
3.07993249e-01	8.12635121e-01	4.88954132e-01	6.15603691e-01
7.05034752e-01	5.51800239e-03	5.10069381e-01	4.71003710e-02
8.71149048e-02	4.97026707e-01	6.79795853e-01	2.17417701e-01
2.10637520e-02	8.47088821e-01	5.66200272e-01	3.94350441e-01
8.63998073e-01	5.64446155e-01	8.29064176e-02	3.47405717e-01
6.32805986e-02	2.07252379e-01	9.10430115e-01	3.07712577e-01
4.12988888e-01	8.18856723e-01	8.26546822e-01	4.19548728e-01
4.02928789e-02	5.96039666e-01	2.82584072e-01	7.35227019e-01
2.78356921e-01	2.86129990e-01	1.71689858e-01	6.80705216e-01
5.84197761e-01	8.82246542e-01	4.11861991e-01	6.19545293e-01
4.69932997e-02	2.10300326e-01	3.35159151e-01	3.28069831e-01
3.38542387e-01	4.26174943e-01	2.89289133e-01	6.38309411e-01
5.50944101e-01	6.75778250e-02	5.73864819e-01	8.56339134e-01
4.16973100e-01	8.53602694e-01	8.77316903e-01	5.65161622e-01
1.83636000e-01	5.74054690e-01	7.36593436e-01	4.79040566e-01
2.20123017e-01	2.93225696e-01	5.46397407e-01	9.62068115e-01
4.19552617e-01	7.35232457e-01	5.77116630e-01	9.85240994e-01

5.72186697e-01	1.69945584e-01	2.82222434e-02	2.51326446e-01
6.07922702e-01	1.62968475e-01	6.57505066e-01	8.52755947e-01
3.22795387e-01	9.89967055e-01	5.80661573e-01	3.47642610e-01
9.48853946e-01	2.87304711e-01	9.86858974e-01	6.14332318e-01
8.04474329e-01	5.78015305e-01	6.28120939e-01	6.60000191e-01
9.09694093e-01	7.67114344e-01	8.66656259e-02	5.56061133e-01
6.38045305e-01	2.13490509e-03	2.87806307e-01	3.82978481e-04
7.78939236e-01	1.61443804e-01	4.43774887e-01	2.66985680e-01
3.47452211e-01	6.74551571e-02	9.50885285e-02	3.32758976e-02
6.71907685e-01	8.13264346e-01	6.26333264e-01	1.33604755e-02
7.67608914e-01	7.61586299e-02	7.59096654e-01	4.63899223e-01
1.34346145e-01	3.15861891e-01	2.76043320e-02	4.54043194e-01
7.19540736e-01	5.23048237e-01	8.36313404e-01	3.33138401e-01
9.92386948e-01	8.58676475e-01	3.57509364e-01	5.27710969e-01
5.81528305e-01	3.00530336e-01	8.33493769e-01	4.09803004e-01
6.60976211e-02	2.04004251e-01	6.92360029e-01	7.85828247e-01
8.72324812e-01	5.98393004e-01	4.27567303e-01	7.37492476e-01
1.68476508e-01	8.18719174e-02	2.48859010e-01	1.72994165e-01
8.56044863e-01	5.00255830e-01	2.26085187e-02	3.85045326e-01
2.09284340e-01	1.71020453e-01	8.53013399e-01	9.54091458e-01
8.39363702e-01	8.61182137e-01	3.01850965e-01	4.53028954e-01
7.10347520e-01	9.50646198e-01	1.38788579e-01	9.38690888e-01
2.19281336e-01	8.54792173e-01	8.80200098e-01	3.93530150e-01
3.42766708e-01	4.69133726e-01	9.49053238e-01	8.90991656e-01
4.65475804e-01	7.55952278e-01	3.38259775e-01	6.08621326e-01
4.87524641e-01	8.05578688e-01	9.90498362e-01	8.42999346e-01
1.76319977e-01	6.37768481e-01	4.99373975e-01	6.32367987e-01
1.54884373e-02	3.21301428e-01	7.10672458e-01	8.65819913e-01
3.62649508e-01	7.65522803e-01	2.49522248e-01	6.95814930e-01
3.24128349e-01	9.80916989e-01	6.00450760e-01	9.47987092e-01
1.74069271e-01	6.12163515e-01	7.56967403e-01	3.05782515e-01
2.72362802e-01	7.31662637e-01	8.92139319e-01	8.49229925e-01
9.45753086e-01	2.97662760e-01	4.35050169e-01	3.41113384e-01
3.70540564e-01	6.13755883e-01	3.92134339e-02	7.34940539e-01
9.89714846e-01	2.99659643e-01	8.61716032e-01	8.23804207e-01
4.25669214e-01	5.82777866e-01	9.27126767e-01	9.69605023e-01
4.35022847e-01	9.40255938e-01	5.90657347e-01	1.54047393e-01
5.52270908e-01	1.49320327e-01	2.98844068e-01	7.51758825e-01
4.37452131e-01	6.75892067e-01	2.47123203e-01	2.55937047e-01

6.91234023e-01	6.67466355e-01	7.27773108e-01	5.86075516e-01
5.10803449e-01	8.45406749e-01	3.51022569e-01	4.81320561e-01
4.19596252e-01	7.19235870e-01	8.26492610e-01	5.75819275e-01
3.72954660e-01	3.23276269e-01	8.18121787e-01	5.12527594e-01
1.73603853e-01	2.43154360e-01	9.37856045e-03	3.42771276e-01
4.23956006e-01	8.84071225e-01	6.19002386e-01	2.95164151e-01
3.32380927e-01	7.75611967e-01	6.55659261e-01	7.56002890e-01
2.94052335e-01	1.30307262e-01	4.84845284e-01	1.71576149e-01
6.39465385e-01	2.65823145e-01	9.09844943e-01	1.90641947e-01
8.18727450e-02	1.03155901e-01	7.51313116e-01	5.45076387e-02
3.51281854e-01	7.33591136e-01	4.78067875e-01	4.69125496e-01
9.61066245e-01	4.50949948e-01	5.36948702e-01	2.70619218e-01
9.81243680e-01	8.00483801e-01	9.20157382e-01	8.02374210e-01
9.74975085e-01	5.93795339e-02	7.94167662e-01	8.78196921e-01
7.50827358e-01	1.93880264e-01	7.05638871e-01	7.25638563e-01
2.86410127e-01	9.56864225e-01	2.52022867e-01	5.69084779e-01
9.89767534e-01	1.70279135e-01	2.07729691e-01	4.02712989e-01
3.17092640e-01	2.33001011e-01	2.68496437e-01	2.71130532e-01
9.86155288e-01	9.73174359e-01	4.17299838e-01	6.69050388e-01
9.84285429e-01	2.63782834e-01	1.90800211e-01	2.97597569e-01
5.75980183e-01	5.20025962e-01	3.80362380e-01	1.55311717e-01
6.61855565e-01	6.15134854e-01	3.89399169e-01	9.70689614e-01
6.10693513e-01	9.05025842e-01	5.67358356e-01	7.63265506e-01
1.53233305e-01	6.25538426e-01	2.36895012e-01	4.85647653e-01
8.99028011e-01	2.39789517e-01	5.17493435e-01	1.23859872e-01
2.72019142e-02	8.12997980e-01	8.20547582e-01	5.10468738e-01
8.23623015e-01	6.62902274e-01	8.64207974e-01	2.72755828e-01
2.95936793e-01	4.32738319e-01	5.36002513e-01	7.88646965e-01
4.55414133e-01	9.56957351e-01	3.53819049e-01	4.62687496e-01
6.25544922e-02	8.74726043e-01	8.30407253e-01	4.64073761e-01
8.25816451e-01	9.69519465e-01	5.30718621e-01	2.33465738e-01
8.59391432e-02	8.39988379e-01	6.03204517e-01	3.75977683e-01
2.84470279e-01	8.85306330e-01	2.82332189e-01	7.69947484e-02
8.18443736e-01	7.09361645e-01	4.90510440e-01	9.31039600e-01
7.17220459e-01	7.45396793e-01	3.83686379e-01	6.75619142e-01
8.87035613e-01	9.29048206e-01	4.64123921e-02	3.66867987e-01
4.87557793e-02	1.59200539e-01	1.49684635e-01	7.77693778e-01
3.65171943e-01	4.39965316e-01	9.84094529e-01	8.27968673e-01
1.66449387e-01	3.13466622e-01	1.58056160e-01	8.60225712e-01

```
1.91858012e-01 4.89692209e-01 1.33615886e-01 8.84150100e-01
4.64817480e-01 5.81644915e-01 3.17883343e-01 8.91509996e-01
1.39761066e-01 2.88185578e-01 9.14174148e-01 8.12077506e-02
5.93796108e-01 9.65704039e-01 6.82531302e-01 1.76142014e-02
5.64243895e-01 3.94032087e-01 7.87767836e-01 6.71698380e-01]
mergeSort: 0.002539396286010742
[0.763796 0.43992574 0.65648939 0.37914733 0.11848491 0.08197032
0.55317106 0.37177479 0.48882095 0.86107442 0.5569663 0.86715847
0.36810463 0.33742208 0.01963836 0.5481687 0.66116046 0.32965449
0.05499287 0.46306332 0.91910827 0.62625549 0.39708141 0.02443194
0.61239495 0.11372864 0.67275525 0.50806114 0.6904825 0.8811847
0.3730476 0.93997918 0.66569825 0.71674267 0.55279185 0.8695604
0.32126446 0.07489965 0.44134921 0.09201246 0.22674486 0.8848461
0.67385302 0.93405975 0.9161123 0.96425253 0.3456847 0.73385334
0.6028193 0.40123972 0.07282625 0.19736842 0.42340423 0.8360395
0.23053238 0.73111884 0.41151814 0.40413524 0.40549944 0.77114614
0.28256766 0.4694396 0.65934558 0.01807368 0.82916976 0.33569522
0.20996839 0.63976403 0.46618768 0.15039076 0.36045694 0.45318156
0.02850848 0.49745588 0.77864484 0.72289647 0.171629 0.63773589
0.35537571 0.78089804 0.66958969 0.81515723 0.8390912 0.94532069
0.11377018 0.89415148 0.97920682 0.54573931 0.5467207 0.41159793
0.85910459 0.23862868 0.63852228 0.52252945 0.71351141 0.99194517
0.58886324 0.6334481 0.56468291 0.20889812 0.72861446 0.52135119
0.72924404 0.69306484 0.87323371 0.59690434 0.56250459 0.51937782
0.85867439 0.17014366 0.51491526 0.75448628 0.84000698 0.74154918
0.28345751 0.95385901 0.78134844 0.9439215 0.78836019 0.24260122
0.09847639 0.59784851 0.41553385 0.91535302 0.5696244 0.48658637
0.22541637 0.86290131 0.73135922 0.98209405 0.500479 0.84658658
0.5543894 0.52076858 0.49101764 0.90242151 0.78262907 0.80818751
0.75501902 0.14461853 0.5971595 0.15862604 0.57015239 0.2336076
0.93124469 0.23816451 0.94931539 0.25501774 0.07673362 0.12399022
0.85652148 0.73224495 0.23769153 0.32906798 0.22487265 0.98317965
0.35709248 0.80748032 0.5206292 0.0713957 0.02526266 0.22945117
0.63119228 0.39230559 0.51989378 0.33184181 0.81555529 0.10164406
0.95474175 0.68601579 0.73983846 0.70908631 0.22765449 0.69379397
0.66030282 0.13842001 0.6493373 0.31334649 0.30883714 0.09098271
0.17072459 0.54416619 0.07398124 0.3762837 0.7612639 0.16484353
0.47575223 0.35782459 0.5296519 0.24172687 0.34633097 0.61580087
0.52576829 0.27144118 0.77814989 0.24742887 0.42082441 0.18422063]
```

0.61112502	0.41602751	0.45431063	0.51330381	0.5567517	0.99788313
0.16061691	0.442452	0.161352	0.20084624	0.05300268	0.44102364
0.37262279	0.4819146	0.59526514	0.45722215	0.73507882	0.20335471
0.59925299	0.69066788	0.44181861	0.26531296	0.55280946	0.92060802
0.15531099	0.37132278	0.30051238	0.58602771	0.29335468	0.56021492
0.74233903	0.99087671	0.07737938	0.78884389	0.81317499	0.47424278
0.1984073	0.42982938	0.12875377	0.48339593	0.76150995	0.58744551
0.49019099	0.99593287	0.25060788	0.33192712	0.4592619	0.33050796
0.72893726	0.08324728	0.2945137	0.08651436	0.45843221	0.08872488
0.94595279	0.82867294	0.3989882	0.32967491	0.03385703	0.68212697
0.49337758	0.7523275	0.28204934	0.46701516	0.80107327	0.50960075
0.16322124	0.17244273	0.95715119	0.35696954	0.55581965	0.36637834
0.95700496	0.57458716	0.91270265	0.52490302	0.31558105	0.03383434
0.06765766	0.27538487	0.16533189	0.15000176	0.88682808	0.77886751
0.57679908	0.03776153	0.71882442	0.81612186	0.11725996	0.69123873
0.60057541	0.60070752	0.82948215	0.11812915	0.17089044	0.42758182
0.28656908	0.51004962	0.30726339	0.41542272	0.31313237	0.61523188
0.66169332	0.30916948	0.1084419	0.47730234	0.77166412	0.68506541
0.94202519	0.43775305	0.95713955	0.8547037	0.43569654	0.82964026
0.05398635	0.93719086	0.90536655	0.95063548	0.17997929	0.89291745
0.79145409	0.33531474	0.40513297	0.95060927	0.66258309	0.84972131
0.34841875	0.62053195	0.50047412	0.27165412	0.06174367	0.09806091
0.85131918	0.88320145	0.84884212	0.56852131	0.28202964	0.77959736
0.04613908	0.12778198	0.34429387	0.18782401	0.60879872	0.38038351
0.6226489	0.31316473	0.63386678	0.93547605	0.70078893	0.31147206
0.59371176	0.87579628	0.13176414	0.48900156	0.11203041	0.39395579
0.69120936	0.71407173	0.80030471	0.94940812	0.65919006	0.89953598
0.20064178	0.4273738	0.21070302	0.27057509	0.22276296	0.40236094
0.92008215	0.043093	0.58738686	0.8687452	0.44340892	0.31286642
0.63787827	0.5664151	0.21386693	0.53227141	0.64966242	0.27979956
0.9642712	0.72629571	0.46285575	0.32899772	0.50422205	0.50626197
0.06332277	0.3752521	0.83881837	0.13773064	0.32524676	0.45778247
0.46116737	0.67273095	0.48070567	0.36882135	0.74828434	0.94117663
0.68558282	0.00362412	0.20338686	0.50431433	0.73210305	0.71596443
0.92816287	0.87307387	0.02634686	0.77900983	0.09022594	0.98771988
0.63199099	0.97281812	0.01666486	0.39500334	0.40398811	0.2374438
0.84813184	0.23802683	0.45271833	0.90587419	0.87969111	0.52351697
0.33051844	0.60047623	0.8171095	0.37484372	0.54151414	0.76231414
0.68406943	0.77539029	0.62498091	0.27975672	0.60283275	0.20044402

```
0.40767968 0.96155903 0.48781023 0.32953929 0.59973007 0.59817524
0.82558081 0.09160668 0.63765722 0.89192578 0.94104317 0.01384713
0.1084779 0.75152404 0.16342949 0.98530996 0.34904105 0.6242644
0.38269143 0.52322535 0.36894076 0.99201256 0.22876712 0.01537147
0.63299176 0.9116026 0.63497973 0.59142685 0.99808684 0.66578622
0.62261485 0.99601224 0.39735462 0.28390977 0.0191384 0.92639334
0.02824904 0.58751824 0.63465391 0.5810263 0.54935373 0.6080435
0.07337827 0.39787043 0.93187779 0.44876811 0.69636972 0.20290014
0.26732519 0.74674642 0.1433324 0.77292797 0.61961917 0.12470097
0.33983133 0.19109459 0.06339969 0.3468207 0.57291486 0.66689913
0.86954608 0.2258397 0.49129217 0.85827786 0.80921099 0.38821301
0.09215207 0.03707427 0.08362556 0.46303629 0.08214778 0.91813276
0.5599097 0.41553153 0.84923417 0.07193389 0.66120625 0.65531488
0.46608387 0.74148914]
quickSort1 (regular): 0.002101421356201172
[0.77417828 0.81503161 0.47890461 0.01821185 0.38045853 0.44481295
0.21585955 0.87730382 0.9692626 0.36439321 0.31447 0.58715394
0.50684002 0.98691987 0.54878357 0.96228624 0.14890159 0.08255954
0.86140779 0.60206743 0.46174737 0.3667268 0.43768106 0.48141473
0.01678249 0.80665544 0.60678595 0.49771901 0.71456441 0.37452174
0.66447886 0.04008435 0.93586076 0.10689603 0.8958522 0.91798464
0.99318339 0.43758303 0.27193303 0.49299252 0.75078599 0.82792146
0.32966278 0.32714183 0.28775391 0.99795941 0.98593185 0.82033411
0.11151454 0.96957446 0.23623875 0.12033071 0.44414175 0.63461597
0.23373844 0.44740503 0.33771173 0.93796841 0.12461617 0.9763915
0.77883155 0.49998804 0.21816107 0.29057441 0.40007161 0.91458547
0.54019835 0.61302682 0.38492144 0.58065845 0.96091913 0.83793231
0.91222993 0.18194734 0.61533724 0.5787362 0.48961693 0.14248437
0.18582866 0.00243958 0.91327757 0.31787498 0.06393497 0.36059041
0.92226305 0.79652603 0.78829712 0.64986647 0.44584489 0.91047811
0.81485514 0.08750933 0.77137926 0.53744204 0.63987695 0.53035405
0.58629871 0.44323302 0.27800567 0.70850387 0.86188529 0.5787129
0.21591274 0.28303974 0.11465031 0.59934062 0.52595207 0.9273715
0.40338925 0.84225257 0.14698491 0.73988053 0.30814984 0.91493941
0.35383529 0.24122556 0.64718195 0.23616548 0.40359981 0.60685833
0.95614861 0.02864969 0.92221411 0.12244475 0.46133634 0.35632178
0.25676731 0.54747787 0.7629798 0.41833215 0.60963366 0.48261523
0.22511164 0.92035605 0.41579866 0.18365373 0.69189894 0.40361515
0.91390882 0.34990498 0.65746113 0.9188112 0.28460718 0.50622789
```

0.31787792	0.1779816	0.9248483	0.38381901	0.92223827	0.80503477
0.83047132	0.25505006	0.88926447	0.95953287	0.88629532	0.64843875
0.16385698	0.789907	0.68217386	0.26058952	0.87075494	0.76222006
0.9426867	0.89441609	0.44569536	0.97697815	0.2729693	0.27761772
0.07803619	0.43280035	0.92079893	0.09329761	0.3107478	0.30813621
0.08413564	0.15934691	0.51626432	0.542941	0.97520888	0.12086988
0.5491089	0.97056326	0.84551967	0.14823569	0.78479858	0.09260616
0.43802562	0.7953112	0.55890285	0.42949485	0.93185519	0.91053851
0.73178118	0.20134828	0.78088445	0.7540375	0.68163031	0.52805095
0.96857783	0.16640622	0.85691544	0.50233642	0.30816565	0.87573013
0.24241245	0.46271217	0.64343235	0.34840085	0.93716786	0.40227942
0.1308161	0.65111849	0.51869275	0.36352832	0.2748342	0.13691956
0.54235642	0.98569115	0.2818257	0.80069604	0.2687939	0.78123435
0.94548742	0.90174387	0.18518536	0.89684071	0.27225268	0.96722455
0.98199603	0.96293581	0.74731386	0.78167182	0.37528467	0.47476613
0.97209639	0.44176895	0.52741263	0.70004786	0.18963774	0.09981388
0.46458118	0.45564984	0.39287144	0.49290698	0.96912983	0.32870214
0.83644957	0.39104982	0.45680789	0.71213286	0.09267107	0.14699208
0.67218422	0.42213998	0.11901828	0.41067953	0.83417948	0.43832689
0.36735218	0.38981419	0.69289788	0.10843309	0.6053013	0.97780297
0.16484512	0.2971485	0.97823513	0.58387796	0.40697661	0.23613232
0.82709644	0.3742044	0.91126657	0.59900611	0.45539253	0.24613227
0.71052827	0.51816609	0.79108527	0.21784081	0.76519516	0.95534439
0.94188259	0.50644773	0.74454057	0.78500524	0.43561402	0.01802096
0.58409973	0.34885974	0.47134393	0.7142123	0.16668979	0.1596887
0.25994796	0.04226618	0.63127655	0.10630511	0.89228052	0.22563585
0.87473822	0.83134346	0.79860818	0.51229978	0.62928966	0.22013963
0.37519065	0.1997258	0.41271633	0.75962531	0.74702753	0.62014913
0.17395017	0.12683832	0.02590627	0.07560213	0.39430685	0.60042246
0.75814855	0.01705268	0.41945818	0.20675734	0.25185156	0.98068967
0.97975018	0.90161703	0.54211955	0.45409944	0.93281515	0.17939089
0.18871946	0.46211301	0.08948812	0.94376403	0.58056156	0.2996571
0.22226719	0.91539753	0.47269335	0.33843288	0.52662494	0.65398968
0.61774377	0.29632206	0.34981878	0.07917719	0.13407895	0.12639653
0.06256769	0.47350427	0.25490471	0.42333975	0.95979795	0.03624167
0.3521215	0.59744844	0.16336186	0.24956792	0.81430778	0.06764414
0.38595042	0.89046882	0.18172171	0.56766806	0.62724695	0.3493271
0.1649737	0.15330176	0.819615	0.30286266	0.62831589	0.66139277
0.76022396	0.23588804	0.22498172	0.92014126	0.86041327	0.96196193



```
0.76146342 0.32974472 0.44742498 0.11427653 0.2707395 0.41517992
0.69204482 0.46930628 0.44754322 0.50137502 0.46799483 0.43698209
0.54671669 0.63693221 0.70969154 0.68100227 0.66804438 0.53542901
0.17157087 0.51123593 0.43922921 0.41422482 0.77862564 0.50206243
0.6085873 0.46217829 0.29061141 0.48352982 0.4857199 0.7805141
0.67581253 0.13674653 0.09257702 0.64021552 0.75807587 0.86515389
0.50388378 0.59046373 0.28480603 0.47148591 0.19998323 0.49675569
0.03560994 0.53968389 0.04243436 0.1692339 0.90133985 0.43304455
0.6743637 0.1484091 0.40797682 0.5475759 0.98676865 0.16052368
0.3559354 0.39814143 0.50834999 0.02721605 0.93224253 0.01255728
0.68816961 0.1649346 0.76482742 0.30287288 0.79933312 0.22262645
0.06270299 0.84827468 0.46161502 0.54859894 0.13254681 0.49164791
0.79383705 0.09578776 0.85588757 0.84206859 0.55277569 0.70917168
0.84866955 0.33809885 0.14703631 0.01148484 0.28165453 0.72954694
0.08893723 0.85290151 0.18540064 0.04550561 0.09183701 0.04830425
0.56868892 0.85139661 0.70117406 0.34317826 0.63029734 0.13062818
0.24572807 0.95333172 0.17546758 0.43352779 0.10151423 0.03941767
0.65910219 0.65264319 0.76507409 0.54016481 0.35660706 0.41929146
0.11071709 0.63952672 0.56126949 0.00232954 0.10849094 0.97234478
0.03554116 0.40887256 0.51541968 0.63598723 0.25973963 0.78768861
0.26808181 0.96127738 0.35996403 0.38493796 0.80546515 0.99484635
0.32541637 0.35350155 0.26396279 0.79648995 0.83102431 0.25593352
0.30006531 0.14772208]
quickSort2 (insertion): 0.0020804405212402344
[0.65696803 0.62762951 0.89047251 0.09792047 0.76212207 0.77730657
0.60873174 0.79339292 0.25310116 0.76514075 0.29552142 0.12988827
0.35801771 0.73221552 0.79080524 0.3852995 0.60101934 0.42093569
0.93917854 0.28779211 0.91190386 0.6170666 0.90820252 0.25421731
0.92636524 0.40134463 0.46167091 0.24291297 0.71133485 0.80300052
0.82924341 0.76092181 0.29163798 0.70214848 0.34492872 0.60206635
0.52736537 0.17162496 0.19284681 0.2451477 0.88527354 0.02835294
0.53197082 0.53721182 0.66851135 0.29689922 0.89836119 0.9179403
0.0647246 0.89719621 0.57972699 0.2334772 0.01855464 0.51141371
0.40286443 0.56690668 0.14394887 0.07910225 0.43817862 0.50399691
0.51209502 0.8836705 0.91405938 0.69078906 0.2584806 0.9764873
0.84123761 0.94421878 0.92288525 0.97160258 0.02847713 0.28997429
0.27224491 0.61869457 0.1591731 0.57417885 0.03596446 0.54976922
0.78610809 0.58618951 0.89211426 0.41227337 0.80824785 0.56010192
0.87532178 0.28963666 0.74187342 0.05471536 0.56871214 0.20624669]
```

0.47111321	0.56777098	0.3600912	0.36205168	0.68745593	0.12940864
0.45026078	0.50148025	0.97369992	0.78589266	0.85338489	0.22480821
0.36944698	0.25559663	0.31873843	0.99784471	0.59507688	0.10957731
0.51359224	0.88631278	0.0634348	0.7964864	0.15155064	0.0816814
0.49721324	0.31180673	0.32012592	0.17802265	0.4600737	0.37203795
0.09575978	0.57081698	0.84695724	0.72609053	0.83039529	0.58581708
0.78874947	0.18301671	0.91100407	0.10361292	0.67663397	0.22992041
0.14706996	0.26381573	0.90848033	0.54576462	0.58978049	0.48530909
0.3522357	0.30855914	0.946793	0.53082825	0.91428655	0.19953319
0.10702887	0.70154425	0.07261356	0.04053992	0.33723842	0.37010219
0.83746296	0.103095	0.24365684	0.19250769	0.14604755	0.53089795
0.67655893	0.46552238	0.03794162	0.39902294	0.51780365	0.42970896
0.74398535	0.19078893	0.38572893	0.78538346	0.91541557	0.30950666
0.96062448	0.72969903	0.81394013	0.48654871	0.75036029	0.13117211
0.8003822	0.72176209	0.19386915	0.83203801	0.12903041	0.33378524
0.95800608	0.17698339	0.43547469	0.77512937	0.76799978	0.48464449
0.49189865	0.35245738	0.30071225	0.42995083	0.72640516	0.7144606
0.84611903	0.47974531	0.49296008	0.62981782	0.56160143	0.46759638
0.73177764	0.25159358	0.33486027	0.94642341	0.85760503	0.86818748
0.95741602	0.31368251	0.8992808	0.76230548	0.68351163	0.36838342
0.77546919	0.23794768	0.23495299	0.44068984	0.01245398	0.72184506
0.60964568	0.79391229	0.73716043	0.51112308	0.37253023	0.63694019
0.63430709	0.70046595	0.58237651	0.49402881	0.84647422	0.47897834
0.51785367	0.8465326	0.53644133	0.0855605	0.86925109	0.65081931
0.55701302	0.0484724	0.10738431	0.43424146	0.59861864	0.94264377
0.44707703	0.65947851	0.41309415	0.77028825	0.16926066	0.24905076
0.16920116	0.37466279	0.90694477	0.87214444	0.18895287	0.73368584
0.31040657	0.12012566	0.64199713	0.73597508	0.11291952	0.81623683
0.93676278	0.6290628	0.93908264	0.59108221	0.66869997	0.91212507
0.59890491	0.60056476	0.52795595	0.74567015	0.87895279	0.26620003
0.62122396	0.93937921	0.90786153	0.11618387	0.49618912	0.0536996
0.99775628	0.89360736	0.25041668	0.81430557	0.69909324	0.69277899
0.94442176	0.3367847	0.26613307	0.97014592	0.33922149	0.87890366
0.57789602	0.00579648	0.94074747	0.17178743	0.55046738	0.87687215
0.35968058	0.721287	0.94396438	0.47964866	0.95998124	0.00418126
0.17857629	0.75858671	0.52006137	0.09211675	0.44431164	0.70217748
0.28539748	0.18721589	0.86678786	0.36516639	0.49447706	0.43417909
0.04297166	0.6398973	0.12500315	0.16486012	0.97658407	0.66381724
0.93284692	0.50099657	0.50060889	0.29654656	0.87178628	0.49536674

```
0.56454593 0.49031764 0.99132337 0.03493795 0.90760691 0.57872452
0.97009123 0.17942028 0.36793653 0.49480499 0.31318496 0.30553301
0.02676507 0.14881563 0.96634713 0.3575076 0.93666952 0.19457592
0.13183945 0.5089396 0.37937861 0.49972018 0.24572899 0.90981631
0.08283924 0.31736073 0.26783186 0.70557774 0.70808911 0.60675644
0.12743951 0.50631168 0.52780866 0.89767628 0.31167525 0.00224191
0.19716929 0.66778819 0.62679614 0.91286916 0.8275161 0.08230447
0.14830673 0.65303738 0.30528558 0.13324576 0.02948753 0.25539064
0.08201627 0.58539891 0.79572272 0.78407874 0.06352846 0.02373793
0.90745167 0.21960367 0.08673681 0.47360168 0.85871309 0.29101824
0.30124179 0.58243195 0.00419454 0.87721667 0.50366922 0.1232989
0.38637596 0.27289771 0.13877546 0.42600713 0.77158462 0.84270077
0.71616539 0.15589679 0.47191063 0.37682378 0.10180047 0.24255398
0.26037492 0.17141722 0.74332643 0.19891795 0.40067374 0.75898619
0.65636834 0.99716822 0.51783203 0.02618716 0.37758391 0.36777337
0.28399613 0.06734667 0.32943761 0.57698006 0.87536905 0.41375045
0.73236179 0.30480099 0.39108406 0.91245997 0.71692832 0.44744919
0.02940509 0.17331132 0.28359152 0.2330433 0.43792756 0.46249706
0.79296957 0.34922231 0.54250948 0.70063678 0.71917121 0.02344926
0.5995016 0.9897416 0.75199211 0.49052082 0.95033337 0.7957965
0.49235304 0.10056004 0.41652478 0.54170451 0.25329431 0.89873049
0.04299108 0.98992571 0.20094322 0.18698316 0.25298914 0.98703285
0.26384847 0.68122954 0.49863739 0.98699543 0.37569084 0.36130907
0.0294929 0.22080248 0.2698622 0.71599841 0.06429149 0.66205624
0.64451083 0.61336775 0.44413309 0.44125398 0.38821363 0.46659964
0.72424523 0.33400595 0.93471906 0.18550975 0.91555248 0.97647845
0.05000439 0.09702052 0.33812535 0.44216967 0.16690546 0.85676767
0.55471455 0.5815502 0.6712071 0.94370161 0.89579119 0.22816707
0.51969166 0.6324438 0.19493613 0.16030142 0.9079558 0.96389484
0.58828602 0.98037196 0.65879159 0.65364466 0.7970676 0.46487141
0.51500932 0.13143054 0.27097343 0.18696459 0.73980639 0.8437021
0.37902672 0.20858099]
```

```
quickSort3 (randomized): 0.0031785964965820312
```

```
array size 2^ 10 or 1024
```

```
[0.58164048 0.17249246 0.86059615 ... 0.2915214 0.20168452 0.51560439]
```

```
insertionSort: 0.09902763366699219
```

```
[0.824503 0.96071036 0.68467217 ... 0.30553944 0.57576294 0.71613024]
```

```
mergeSort: 0.009781122207641602
```

```
[0.11707605 0.16803148 0.30696538 ... 0.13115658 0.5473625 0.08850937]
quickSort1 (regular): 0.006072282791137695
[0.85103849 0.76932536 0.33694406 ... 0.28092628 0.52934141 0.75680204]
quickSort2 (insertion): 0.004659175872802734
[0.67587366 0.45758718 0.01701981 ... 0.22662935 0.12067144 0.24848973]
quickSort3 (randomized): 0.007203102111816406
```

array size 2<sup>11</sup> or 2048

```
[0.79596279 0.14702914 0.62095266 ... 0.94208827 0.01292619 0.34339428]
insertionSort: 0.3830454349517822
[0.25634845 0.41879785 0.93195043 ... 0.69058768 0.01103783 0.87293853]
mergeSort: 0.011673688888549805
[0.37099172 0.48638346 0.14137278 ... 0.78497832 0.56132103 0.91592707]
quickSort1 (regular): 0.011732101440429688
[0.75391901 0.51515341 0.55080798 ... 0.62896211 0.9048614 0.28025954]
quickSort2 (insertion): 0.01094675064086914
[0.69082245 0.24392973 0.50958961 ... 0.9593783 0.11832884 0.18478841]
quickSort3 (randomized): 0.01485753059387207
```

array size 2<sup>12</sup> or 4096

```
[0.52939654 0.9098343 0.66499189 ... 0.13686476 0.78790939 0.09161829]
insertionSort: 1.5061674118041992
[0.48124055 0.45390071 0.98986563 ... 0.67732956 0.19841991 0.38713747]
mergeSort: 0.025861501693725586
[0.01271998 0.80522347 0.81797328 ... 0.64906063 0.42270866 0.18833186]
quickSort1 (regular): 0.02292013168334961
[0.1508852 0.88017468 0.46940906 ... 0.04258021 0.97767762 0.40554089]
quickSort2 (insertion): 0.02345442771911621
[0.61202705 0.35475004 0.90161111 ... 0.40650254 0.70755578 0.84226414]
quickSort3 (randomized): 0.032201528549194336
```

array size 2<sup>13</sup> or 8192

```
[0.52509632 0.18815224 0.84570831 ... 0.0398092 0.75700041 0.65866503]
insertionSort: 6.138788223266602
[0.60791409 0.64113924 0.56374316 ... 0.97659273 0.5612767 0.96863568]
mergeSort: 0.05456137657165527
[0.15866469 0.86998997 0.46530947 ... 0.9649824 0.81647683 0.58383303]
quickSort1 (regular): 0.047617435455322266
[0.32725439 0.70279192 0.28802799 ... 0.2764451 0.07481889 0.93729735]
```

```
quickSort2 (insertion): 0.04831838607788086  
[0.44946583 0.80003707 0.78291576 ... 0.72564888 0.72981858 0.13462916]  
quickSort3 (randomized): 0.0677182674407959
```

```
array size 2^ 14 or 16384  
[0.53805062 0.71057117 0.78060283 ... 0.61338404 0.75162587 0.84459809]  
insertionSort: 24.133598804473877  
[0.96780365 0.05571546 0.22464851 ... 0.48950483 0.20750261 0.53135091]  
mergeSort: 0.11864423751831055  
[0.34953324 0.33962786 0.79871994 ... 0.19378356 0.39091279 0.18502202]  
quickSort1 (regular): 0.10784053802490234  
[0.85923782 0.58154811 0.6101188 ... 0.02128348 0.81577168 0.0653792 ]  
quickSort2 (insertion): 0.10643577575683594  
[0.87178463 0.4231783 0.14401819 ... 0.70290755 0.86365647 0.95804488]  
quickSort3 (randomized): 0.14770865440368652
```

```
array size 2^ 15 or 32768  
[0.747332 0.80053663 0.87875139 ... 0.47648355 0.47039649 0.00246594]  
insertionSort: 96.89109086990356  
[0.23953458 0.82860667 0.23517516 ... 0.8229975 0.93307306 0.52072952]  
mergeSort: 0.2615525722503662  
[0.57409048 0.8114139 0.66885797 ... 0.27471463 0.37248692 0.97080038]  
quickSort1 (regular): 0.22238588333129883  
[0.33303549 0.79928051 0.19664017 ... 0.05629885 0.64034271 0.85442271]  
quickSort2 (insertion): 0.2234327793121338  
[0.30479084 0.20381507 0.3266606 ... 0.57952456 0.2182267 0.55047122]  
quickSort3 (randomized): 0.2999446392059326
```

```
array size 2^ 16 or 65536  
[0.28809449 0.27955864 0.53682159 ... 0.18092193 0.63344362 0.15468926]  
insertionSort: 388.92271089553833  
[0.33379467 0.26013731 0.70174222 ... 0.72303716 0.11571158 0.25525604]  
mergeSort: 0.5533151626586914  
[0.62094364 0.70849036 0.02500636 ... 0.48861909 0.07984468 0.62729023]  
quickSort1 (regular): 0.4862337112426758  
[0.09205128 0.14856244 0.73832678 ... 0.70118216 0.36968764 0.9697843 ]  
quickSort2 (insertion): 0.472137451171875  
[0.66647094 0.90492181 0.34522801 ... 0.03716611 0.39657033 0.21932001]  
quickSort3 (randomized): 0.6329748630523682
```