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: <https://colab.research.google.com/drive/1xdrHHqchwUpGQlh8dRpBg5tgRgCMMYPF> | | | | | | | | |
| Insertion Sort | | | | | | | |
| Merge Sort | | | | | | | |
| QuickSort1 (regular) | | | | | | | |
| QuickSort2 (insertion) | | | | | | | |
| QuickSort3 (randomized) | | | | | | | |
| Test 1 | | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 1.9788742065429688e-05 | 9.298324584960938e-06 | 1.4781951904296875e-05 | 4.410743713378906e-05 | 0.00013589859008789062 | 0.0006570816040039062 | 0.001874685287475586 | 0.005904197692871094 | | 0.02298450469970703 | 0.09591913223266602 | 0.3748183250427246 | 1.5076591968536377 | 5.980031728744507 | 24.51366686820984 | 99.07651042938232 | 396.4576749801636 |
| 0.0005977153778076172 | 1.8358230590820312e-05 | 3.075599670410156e-05 | 7.414817810058594e-05 | 0.00014209747314453125 | 0.0010983943939208984 | 0.0005409717559814453 | 0.0012025833129882812 | | 0.00264739990234375 | 0.005637407302856445 | 0.011820077896118164 | 0.025551557540893555 | 0.05582880973815918 | 0.11819720268249512 | 0.2582390308380127 | 0.5447902679443359 |
| 8.106231689453125e-06 | 1.3828277587890625e-05 | 2.2172927856445312e-05 | 5.793571472167969e-05 | 0.00011849403381347656 | 0.0002980232238769531 | 0.000484466552734375 | 0.0009200572967529297 | | 0.002172708511352539 | 0.00493621826171875 | 0.010532379150390625 | 0.0238800048828125 | 0.04873156547546387 | 0.11296939849853516 | 0.2293834686279297 | 0.48235344886779785 |
| 1.049041748046875e-05 | 1.0967254638671875e-05 | 1.8835067749023438e-05 | 7.987022399902344e-05 | 0.00015306472778320312 | 0.0003426074981689453 | 0.0004470348358154297 | 0.0010242462158203125 | | 0.0023488998413085938 | 0.0045354366302490234 | 0.010340452194213867 | 0.022886037826538086 | 0.05108332633972168 | 0.11111044883728027 | 0.2416706085205078 | 0.5120372772216797 |
| 3.743171691894531e-05 | 2.1696090698242188e-05 | 8.153915405273438e-05 | 0.00012063980102539062 | 0.0002372264862060547 | 0.0011515617370605469 | 0.0007414817810058594 | 0.001642465591430664 | | 0.003305673599243164 | 0.00799417495727539 | 0.014928579330444336 | 0.033414602279663086 | 0.07397675514221191 | 0.14619064331054688 | 0.3155252933502197 | 0.6511597633361816 |

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| Test 2 | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 1.4066696166992188e-05 | 2.8371810913085938e-05 | 1.8358230590820312e-05 | 5.125999450683594e-05 | 0.00013875961303710938 | 0.0004017353057861328 | 0.0015082359313964844 | 0.005150556564331055 | 0.02187061309814453 | 0.09389853477478027 | 0.3863871097564697 | 1.5177724361419678 | 6.062641859054565 | 23.29828906059265 | 97.00371527671814 | 379.55427718162537 |
| 2.0265579223632812e-05 | 6.580352783203125e-05 | 5.3882598876953125e-05 | 6.890296936035156e-05 | 0.00012612342834472656 | 0.00026488304138183594 | 0.0005223751068115234 | 0.001271963119506836 | 0.002461671829223633 | 0.005407810211181641 | 0.01152801513671875 | 0.025415420532226562 | 0.055023908615112305 | 0.12050175666809082 | 0.2515695095062256 | 0.552760124206543 |
| 7.152557373046875e-06 | 1.7881393432617188e-05 | 2.8371810913085938e-05 | 4.887580871582031e-05 | 0.00010538101196289062 | 0.0001785755157470703 | 0.0005598068237304688 | 0.0009598731994628906 | 0.0022301673889160156 | 0.005354881286621094 | 0.010283946990966797 | 0.021699190139770508 | 0.04911494255065918 | 0.10343790054321289 | 0.24290108680725098 | 0.4805922508239746 |
| 7.62939453125e-06 | 1.6927719116210938e-05 | 3.886222839355469e-05 | 6.151199340820312e-05 | 0.00010514259338378906 | 0.00017404556274414062 | 0.0003807544708251953 | 0.0008778572082519531 | 0.0020461082458496094 | 0.004572153091430664 | 0.01071023941040039 | 0.021375179290771484 | 0.04887270927429199 | 0.10588550567626953 | 0.2130587100982666 | 0.4625399112701416 |
| 2.0742416381835938e-05 | 3.361701965332031e-05 | 6.508827209472656e-05 | 9.5367431640625e-05 | 0.00020766258239746094 | 0.00035858154296875 | 0.0006666183471679688 | 0.0014870166778564453 | 0.003215312957763672 | 0.0071485042572021484 | 0.015147686004638672 | 0.03202366828918457 | 0.07055306434631348 | 0.14788246154785156 | 0.31083106994628906 | 0.6407041549682617 |

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| Test 3 | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 1.7404556274414062e-05 | 6.9141387939453125e-06 | 1.9550323486328125e-05 | 4.673004150390625e-05 | 0.00015687942504882812 | 0.0006043910980224609 | 0.0025424957275390625 | 0.0054204463958740234 | 0.02219367027282715 | 0.09414792060852051 | 0.3774888515472412 | 1.5215239524841309 | 5.9613916873931885 | 23.672234058380127 | 94.8729338645935 | 381.5673372745514 |
| 1.239776611328125e-05 | 1.5974044799804688e-05 | 3.218650817871094e-05 | 6.580352783203125e-05 | 0.00016736984252929688 | 0.0003657341003417969 | 0.0008437633514404297 | 0.0010945796966552734 | 0.002727508544921875 | 0.00694584846496582 | 0.011820316314697266 | 0.0255734920501709 | 0.05511355400085449 | 0.11738705635070801 | 0.26146864891052246 | 0.5452415943145752 |
| 9.298324584960938e-06 | 1.0728836059570312e-05 | 2.4318695068359375e-05 | 4.7206878662109375e-05 | 0.00012063980102539062 | 0.00031566619873046875 | 0.0006175041198730469 | 0.0009319782257080078 | 0.002063274383544922 | 0.004575252532958984 | 0.010151863098144531 | 0.02177739143371582 | 0.050848960876464844 | 0.1065969467163086 | 0.2195277214050293 | 0.4753744602203369 |
| 1.0967254638671875e-05 | 1.049041748046875e-05 | 2.3365020751953125e-05 | 4.982948303222656e-05 | 0.00014925003051757812 | 0.00037980079650878906 | 0.0006427764892578125 | 0.0008552074432373047 | 0.002368927001953125 | 0.004799842834472656 | 0.009870529174804688 | 0.021442413330078125 | 0.04709672927856445 | 0.10499024391174316 | 0.22549033164978027 | 0.4823012351989746 |
| 2.7894973754882812e-05 | 2.5033950805664062e-05 | 4.506111145019531e-05 | 0.00011610984802246094 | 0.0002827644348144531 | 0.0006008148193359375 | 0.001165151596069336 | 0.0014712810516357422 | 0.0032601356506347656 | 0.0071070194244384766 | 0.015625715255737305 | 0.030518770217895508 | 0.06894230842590332 | 0.15080976486206055 | 0.33722805976867676 | 0.6176192760467529 |

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| Test 4 | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 1.5974044799804688e-05 | 2.9802322387695312e-05 | 1.6450881958007812e-05 | 5.054473876953125e-05 | 0.0002048015594482422 | 0.0005128383636474609 | 0.0015244483947753906 | 0.0054471492767333984 | 0.022506237030029297 | 0.09090805053710938 | 0.40963101387023926 | 1.5283935070037842 | 6.045779228210449 | 24.240617036819458 | 95.62985610961914 | 387.2707488536835 |
| 1.0251998901367188e-05 | 1.9311904907226562e-05 | 3.409385681152344e-05 | 8.249282836914062e-05 | 0.00018644332885742188 | 0.00043487548828125 | 0.0007610321044921875 | 0.0011544227600097656 | 0.0024483203887939453 | 0.00537872314453125 | 0.011855363845825195 | 0.02510547637939453 | 0.05515408515930176 | 0.11745667457580566 | 0.25649547576904297 | 0.5393784046173096 |
| 1.1920928955078125e-05 | 1.52587890625e-05 | 2.765655517578125e-05 | 5.173683166503906e-05 | 0.00010991096496582031 | 0.0003337860107421875 | 0.0007698535919189453 | 0.0008313655853271484 | 0.0022020339965820312 | 0.004239797592163086 | 0.010725975036621094 | 0.022151470184326172 | 0.04708695411682129 | 0.1066288948059082 | 0.216749906539917 | 0.4614584445953369 |
| 9.5367431640625e-06 | 4.6253204345703125e-05 | 2.8133392333984375e-05 | 4.935264587402344e-05 | 0.0001246929168701172 | 0.0002980232238769531 | 0.0007927417755126953 | 0.0008862018585205078 | 0.0021724700927734375 | 0.0048558712005615234 | 0.011092424392700195 | 0.02127385139465332 | 0.0486292839050293 | 0.10474348068237305 | 0.2296924591064453 | 0.46325182914733887 |
| 2.3365020751953125e-05 | 3.552436828613281e-05 | 5.626678466796875e-05 | 0.00010752677917480469 | 0.00024318695068359375 | 0.0005207061767578125 | 0.0006897449493408203 | 0.0014269351959228516 | 0.0033385753631591797 | 0.007014036178588867 | 0.015080928802490234 | 0.0324702262878418 | 0.06583571434020996 | 0.15391826629638672 | 0.2931859493255615 | 0.6341650485992432 |

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| Test 5 | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 1.4066696166992188e-05 | 9.5367431640625e-06 | 1.7404556274414062e-05 | 2.956390380859375e-05 | 0.00011515617370605469 | 0.00046133995056152344 | 0.0013515949249267578 | 0.0055561065673828125 | 0.02263045310974121 | 0.09677839279174805 | 0.3781099319458008 | 1.518526315689087 | 6.059403896331787 | 24.3526132106781 | 97.59611773490906 | 388.0998156070709 |
| 2.0265579223632812e-05 | 1.4066696166992188e-05 | 2.2411346435546875e-05 | 4.863739013671875e-05 | 0.00012421607971191406 | 0.0002548694610595703 | 0.0005807876586914062 | 0.0010991096496582031 | 0.0025691986083984375 | 0.007201671600341797 | 0.01165318489074707 | 0.025860071182250977 | 0.05495166778564453 | 0.11662864685058594 | 0.2564809322357178 | 0.5477721691131592 |
| 3.457069396972656e-05 | 1.1444091796875e-05 | 2.4318695068359375e-05 | 3.504753112792969e-05 | 7.915496826171875e-05 | 0.0001723766326904297 | 0.0005018711090087891 | 0.0008938312530517578 | 0.0020771026611328125 | 0.005140066146850586 | 0.010058403015136719 | 0.022065162658691406 | 0.04815936088562012 | 0.10753965377807617 | 0.2534604072570801 | 0.47545623779296875 |
| 9.059906005859375e-06 | 1.1444091796875e-05 | 1.7881393432617188e-05 | 6.794929504394531e-05 | 7.700920104980469e-05 | 0.00019311904907226562 | 0.0005190372467041016 | 0.0009531974792480469 | 0.0020732879638671875 | 0.00490880012512207 | 0.010571002960205078 | 0.02361464500427246 | 0.05034351348876953 | 0.10486245155334473 | 0.21944069862365723 | 0.47923898696899414 |
| 1.811981201171875e-05 | 2.3365020751953125e-05 | 3.695487976074219e-05 | 7.081031799316406e-05 | 0.000194549560546875 | 0.0003707408905029297 | 0.0006735324859619141 | 0.0014421939849853516 | 0.003491640090942383 | 0.006934165954589844 | 0.014786243438720703 | 0.031386375427246094 | 0.07045149803161621 | 0.1437993049621582 | 0.3270866870880127 | 0.632770299911499 |

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| Average | | | | | | | | | | | | | | | |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 210 | 211 | 212 | 213 | 214 | 215 | 216 |
| 0.00001626014709473 | 0.00001678466796875 | 0.00001730918884277 | 0.00004444122314453 | 0.00015029907226563 | 0.00052747726440430 | 0.00176029205322265 | 0.00549569129943847 | 0.02243709564208980 | 0.09433040618896480 | 0.38528704643249500 | 1.51877508163452000 | 6.02184967994689000 | 24.01548404693600000 | 96.83582668304440000 | 386.58997077941800000 |
| 0.00013217926025391 | 0.00002670288085937 | 0.00003466606140137 | 0.00006799697875977 | 0.00014925003051758 | 0.00048375129699707 | 0.00064978599548340 | 0.00116453170776367 | 0.00257081985473632 | 0.00611429214477539 | 0.01173539161682120 | 0.02550120353698730 | 0.05521440505981440 | 0.11803426742553700 | 0.25685071945190400 | 0.54598851203918400 |
| 0.00001420974731445 | 0.00001382827758789 | 0.00002536773681641 | 0.00004816055297852 | 0.00010671615600586 | 0.00025968551635742 | 0.00058670043945313 | 0.00090742111206055 | 0.00214905738830566 | 0.00484924316406250 | 0.01035051345825190 | 0.02231464385986330 | 0.04878835678100580 | 0.10743455886840800 | 0.23240451812744100 | 0.47504696846008200 |
| 0.00000953674316406 | 0.00001921653747559 | 0.00002541542053223 | 0.00006170272827148 | 0.00012183189392090 | 0.00027751922607422 | 0.00055646896362305 | 0.00091934204101562 | 0.00220193862915038 | 0.00473442077636718 | 0.01051692962646480 | 0.02211842536926260 | 0.04920511245727530 | 0.10631842613220200 | 0.22587056159973100 | 0.47987384796142500 |
| 0.00002551078796387 | 0.00002784729003906 | 0.00005698204040527 | 0.00010209083557129 | 0.00023307800292969 | 0.00060048103332519 | 0.00078730583190918 | 0.00149397850036621 | 0.00332226753234863 | 0.00723958015441894 | 0.01511383056640620 | 0.03196272850036620 | 0.06995186805725090 | 0.14852008819580000 | 0.31677141189575100 | 0.63528370857238700 |

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.

![A screenshot of a cell phone

Description automatically generated]()Sample output looks like: My code looks like:  
array size 2^ 1 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^ 2 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^ 3 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

[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^ 4 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^ 5 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]

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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

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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

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7.27975995e-02 7.81747917e-01 5.84630681e-01 3.82557835e-01

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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]

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[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]

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[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

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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

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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

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0.02824904 0.58751824 0.63465391 0.5810263 0.54935373 0.6080435

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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

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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

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0.18582866 0.00243958 0.91327757 0.31787498 0.06393497 0.36059041

0.92226305 0.79652603 0.78829712 0.64986647 0.44584489 0.91047811

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0.31787792 0.1779816 0.9248483 0.38381901 0.92223827 0.80503477

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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^ 11 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^ 12 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^ 13 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