

Programming Assignment 1:

Parallel Monte Carlo technique for calculating pi using MultiThreading in C++

Design of the program:

- The values of N(no. of points) and K(no. of points) is taken from inp.txt(input file)
 - Clock is started to calculate the time taken for the threads to complete the process before the creation of threads. K no. of threads are created using a loop and they are given the task of function "runner".
 - A structure(thread_info) to store information about each thread is created with 3 variables, count of no. of points inside the circle, points inside the square and circle. The latter two are pointers which are allocated space in the heap using malloc in the runner function and freed at the end of the main function.
 - A space of the above-mentioned structure is allocated to each thread using malloc in the main function which is later freed at the end of the main function.
 - In the function "runner", random numbers between -1 and 1(inside the square) are generated using rand() and srand() and checked if they are inside the circle. The count of the number of points inside the circle are noted using two variables, one of threads(count_circle) and another for all threads together(circle_count).
 - The points inside the circle and square are stored in the structure created for each thread along with the count of the number of points inside the circle.
 - The main thread calculates the value of pi using the count of points inside the circle and total no. of points, i.e; N. The value calculated is noted into the output file along with time. Then the information about each thread that is stored using the struct is logged into the output file.
-

Analysis of the output:

For input N=1000(no.of points) and K=8(no. of threads)

Output:

Time: 1215 microseconds

Value Computed: 3.172

Log:

Thread1:125, 102

Points inside the square: (0.568866, -0.0876117),(-0.675826, -0.512852),(0.199485, 0.0302908),(0.486231, 0.28932),(-0.489284, -0.428413),(0.401842, -0.544047),(-0.470558, -0.166882),(-0.137566, 0.307247),(0.747696, 0.842542),(-0.274714, -0.815522),(0.556398, 0.93738),(-0.329332, 0.869748),(-0.840625, 0.916013),(-0.364287, -0.387588),(0.653892, 0.433101),(-0.189706, 0.222759),(-0.654511, 0.134468),(0.709907, 0.544974),(-0.835241, 0.196138),(-0.165706, -0.324525),(0.767725, -0.763864),(0.131428, -0.702833),(0.0692545, 0.993863),(0.604414, -0.183049),(0.836405, -0.670301),(0.00142924, 0.392803),(-0.732921, 0.672097),(0.262551, -0.573546),(0.58811, 0.898264),(0.0388661, 0.242002),(0.331364, 0.84916),(-0.535239, 0.676853),(-0.0163719, -0.825332),(0.221828, 0.148387),(0.370806, -0.943878),(0.823862, 0.138531),(-0.707742, -0.0447095),(0.435698, 0.361513),(-0.0508467, 0.0401114),(-0.821536, -0.214441),(0.369811, 0.179893),(-0.821638, 0.63689),(-0.14801, 0.440913),(-0.936656, -0.5599),(0.339177, 0.10221),(0.682102, -0.329459),(-0.0486297, -0.853137),(-0.652606, 0.934998),(-0.678469, 0.569222),(0.0833854, 0.692337),(0.625345, -0.0927525),(-0.169132, 0.917603),(0.862538, -0.733435),(0.279116, -0.188309),(0.306677, 0.457579),(0.59725, -0.323513),(-0.362528, 0.775612),(-0.686622, 0.489462),(0.216524, -0.623278),(0.929562, -0.444299),(0.478932, 0.611664),(0.226242, -0.569697),(0.758527, 0.573637),(-0.634699, -0.919942),(0.142859, 0.448686),(0.772395, -0.231797),(-0.644066, -0.396737),(-0.314194, -0.781528),(-0.130172, 0.964922),(0.0301633, -0.823495),(0.422501, -0.372587),(-0.147008, -0.940026),(-0.596975, 0.16637),(0.549436, 0.619549),(0.543092, 0.478998),(-0.82475, 0.022024),(0.090662, 0.401492),(0.452327, -0.150811),(-0.0248712, 0.817628),(-0.0707521, -0.882012),(0.266314, -0.298357),(-0.113809, 0.622248),(0.304906,

0.571998),(0.84072, -0.825266),(0.53692, -0.129117),(-0.648762, -0.0405787),(0.498297, 0.20423),(0.019395, 0.901321),(-0.6294, -0.431169),(0.520871, 0.913692),(-0.952171, 0.696121),(-0.0642844, 0.138491),(0.0976132, -0.611958),(0.98768, -0.927258),(-0.79433, -0.0830721),(-0.80927, 0.471984),(0.618571, 0.076921),(0.0942323, -0.0765232),(-0.351081, -0.0650476),(0.0982105, -0.814162),(0.805836, 0.449449),(0.14526, 0.304133),(-0.346321, -0.835345),(0.205454, 0.0242793),(-0.266514, -0.273675),(-0.062029, -0.218686),(-0.577555, 0.873687),(0.919805, 0.520059),(-0.738271, 0.907485),(0.592801, -0.532601),(-0.175587, 0.78353),(0.939383, -0.557016),(-0.139549, 0.0336155),(0.36646, 0.50937),(0.968568, -0.535329),(0.695208, 0.774404),(0.91412, -0.159532),(0.0785364, -0.432201),(0.00512292, -0.71601),(0.592079, 0.738608),(0.0103149, -0.469951),(-0.480077, 0.43276),(-0.596264, -0.560273),(-0.0471809, -0.334535),(-0.652788, -0.45438),

Points inside the circle: (0.568866, -0.0876117),(-0.675826, -0.512852),(0.199485, 0.0302908),(0.486231, 0.28932),(-0.489284, -0.428413),(0.401842, -0.544047),(-0.470558, -0.166882),(-0.137566, 0.307247),(-0.274714, -0.815522),(-0.329332, 0.869748),(-0.364287, -0.387588),(0.653892, 0.433101),(-0.189706, 0.222759),(-0.654511, 0.134468),(0.709907, 0.544974),(-0.835241, 0.196138),(-0.165706, -0.324525),(0.131428, -0.702833),(0.0692545, 0.993863),(0.604414, -0.183049),(0.00142924, 0.392803),(-0.732921, 0.672097),(0.262551, -0.573546),(0.0388661, 0.242002),(0.331364, 0.84916),(-0.535239, 0.676853),(-0.0163719, -0.825332),(0.221828, 0.148387),(0.823862, 0.138531),(-0.707742, -0.0447095),(0.435698, 0.361513),(-0.0508467, 0.0401114),(-0.821536, -0.214441),(0.369811, 0.179893),(-0.14801, 0.440913),(0.339177, 0.10221),(0.682102, -0.329459),(-0.0486297, -0.853137),(-0.678469, 0.569222),(0.0833854, 0.692337),(0.625345, -0.0927525),(-0.169132, 0.917603),(0.279116, -0.188309),(0.306677, 0.457579),(0.59725, -0.323513),(-0.362528, 0.775612),(-0.686622, 0.489462),(0.216524, -0.623278),(0.478932, 0.611664),(0.226242, -0.569697),(0.758527, 0.573637),(0.142859, 0.448686),(0.772395, -0.231797),(-0.644066, -0.396737),(-0.314194, -0.781528),(-0.130172, 0.964922),(0.0301633, -0.823495),(0.422501, -0.372587),(-0.147008, -0.940026),(-0.596975, 0.16637),(0.549436, 0.619549),(0.543092, 0.478998),(-0.82475, 0.022024),(0.090662, 0.401492),(0.452327, -0.150811),(-0.0248712, 0.817628),(-0.0707521, -0.882012),(0.266314, -0.298357),(-0.113809, 0.622248),(0.304906, 0.571998),(0.53692, -0.129117),(-0.648762, -0.0405787),(0.498297, 0.20423),(0.019395, 0.901321),(-0.6294, -0.431169),(-0.0642844, 0.138491),(0.0976132, -0.611958),(-0.79433, -0.0830721),(-0.80927, 0.471984),(0.618571, 0.076921),(0.0942323, -0.0765232),(-0.351081, -0.0650476),(0.0982105,

-0.814162),(0.805836, 0.449449),(0.14526, 0.304133),(-0.346321, -0.835345),(0.205454, 0.0242793),(-0.266514, -0.273675),(-0.062029, -0.218686),(0.592801, -0.532601),(-0.175587, 0.78353),(-0.139549, 0.0336155),(0.36646, 0.50937),(0.91412, -0.159532),(0.0785364, -0.432201),(0.00512292, -0.71601),(0.592079, 0.738608),(0.0103149, -0.469951),(-0.480077, 0.43276),(-0.596264, -0.560273),(-0.0471809, -0.334535),(-0.652788, -0.45438),

Thread2:125, 96

Points inside the square: (0.132864, 0.171625),(-0.67085, 0.0722472),(0.614608, 0.189601),(-0.894137, -0.0189311),(-0.301028, -0.925569),(0.44574, -0.60582),(0.848835, 0.35986),(0.234648, -0.0726291),(0.927659, -0.760229),(0.211361, 0.519738),(0.97838, -0.778324),(-0.950213, -0.501698),(0.654437, -0.546477),(-0.0619705, -0.392744),(0.118988, 0.285242),(0.152875, -0.748148),(-0.543134, 0.482025),(0.324099, -0.928525),(-0.328373, 0.429962),(0.0525439, 0.370598),(0.504393, -0.501716),(0.764778, 0.353227),(0.858144, -0.000573393),(-0.719402, 0.785803),(0.239198, 0.49196),(0.30554, 0.217577),(0.713636, 0.355327),(0.715879, 0.368072),(0.80885, -0.346091),(0.975328, -0.0721618),(0.939151, 0.128203),(0.17969, -0.603983),(-0.389772, -0.49621),(-0.532508, 0.281855),(0.933752, 0.520036),(-0.347546, 0.438145),(-0.98168, -0.582768),(-0.208628, 0.876463),(0.416659, 0.0719703),(0.662266, -0.344144),(-0.43607, -0.0321942),(0.873434, -0.722435),(-0.676867, 0.589313),(0.645638, -0.868017),(-0.756778, 0.620965),(0.0598213, -0.817627),(-0.250832, -0.760488),(-0.42161, 0.359397),(-0.256699, 0.0458818),(-0.358748, -0.322947),(-0.434082, 0.293706),(-0.884802, -0.415763),(0.710938, -0.0934302),(-0.539299, 0.127596),(0.97854, -0.877034),(0.783453, -0.45753),(0.0907722, 0.656887),(-0.179965, 0.413905),(0.2462, -0.534327),(0.545888, 0.489422),(-0.913362, -0.394291),(0.671795, -0.164193),(-0.154779, -0.749816),(-0.804796, 0.588522),(0.296066, -0.163544),(-0.734424, 0.861984),(-0.869838, -0.619227),(-0.553779, 0.841099),(0.287343, -0.0930781),(-0.0313042, 0.265883),(0.0298882, -0.247851),(0.808353, -0.87934),(-0.590965, -0.371611),(0.534566, 0.655235),(0.0940615, 0.0804537),(0.144657, 0.1807),(0.686163, -0.183549),(-0.983493, -0.468616),(0.0666358, -0.78829),(-0.880093, -0.637298),(0.048166, -0.614518),(-0.775314, 0.178328),(-0.233744, -0.329093),(0.0194269, -0.946401),(0.577829, 0.988123),(0.319482, -0.392283),(-0.259729, 0.127835),(-0.271622, 0.149306),(0.756224, -0.737057),(-0.195459, -0.149715),(0.343397, 0.949198),(-0.969015, 0.0295603),(-0.234351, -0.952508),(0.560945, 0.832285),(-0.740798, 0.680851),(-0.805013, 0.307368),(-0.933667, -0.580327),(-0.514304, -0.167411),(0.0905808, 0.505123),(-0.113812, -0.33159),(0.493245, -0.79433),(0.276128, -0.766483),(0.333505,

-0.995495),(0.382823, 0.0897294),(-0.732551, -0.812636),(0.940015, 0.610846),(-0.863438, 0.971),(-0.359594, -0.097788),(-0.981508, -0.798649),(-0.265503, -0.722306),(0.882202, -0.0705154),(0.585062, 0.948536),(0.349158, -0.929242),(-0.218875, -0.560261),(0.57588, 0.667313),(0.108149, 0.0691257),(0.872983, -0.615724),(0.302642, 0.206488),(-0.611218, -0.314535),(-0.703782, -0.343769),(-0.12717, -0.763768),(-0.732923, 0.00939224),(-0.792768, -0.0925166),(0.911604, -0.774276),(0.108834, -0.353899),

Points inside the circle: (0.132864, 0.171625),(-0.67085, 0.0722472),(0.614608, 0.189601),(-0.894137, -0.0189311),(-0.301028, -0.925569),(0.44574, -0.60582),(0.848835, 0.35986),(0.234648, -0.0726291),(0.211361, 0.519738),(0.654437, -0.546477),(-0.0619705, -0.392744),(0.118988, 0.285242),(0.152875, -0.748148),(-0.543134, 0.482025),(0.324099, -0.928525),(-0.328373, 0.429962),(0.0525439, 0.370598),(0.504393, -0.501716),(0.764778, 0.353227),(0.858144, -0.000573393),(0.239198, 0.49196),(0.30554, 0.217577),(0.713636, 0.355327),(0.715879, 0.368072),(0.80885, -0.346091),(0.975328, -0.0721618),(0.939151, 0.128203),(0.17969, -0.603983),(-0.389772, -0.49621),(-0.532508, 0.281855),(-0.347546, 0.438145),(-0.208628, 0.876463),(0.416659, 0.0719703),(0.662266, -0.344144),(-0.43607, -0.0321942),(-0.676867, 0.589313),(-0.756778, 0.620965),(0.0598213, -0.817627),(-0.250832, -0.760488),(-0.42161, 0.359397),(-0.256699, 0.0458818),(-0.358748, -0.322947),(-0.434082, 0.293706),(-0.884802, -0.415763),(0.710938, -0.0934302),(-0.539299, 0.127596),(0.783453, -0.45753),(0.0907722, 0.656887),(-0.179965, 0.413905),(0.2462, -0.534327),(0.545888, 0.489422),(-0.913362, -0.394291),(0.671795, -0.164193),(-0.154779, -0.749816),(-0.804796, 0.588522),(0.296066, -0.163544),(0.287343, -0.0930781),(-0.0313042, 0.265883),(0.0298882, -0.247851),(-0.590965, -0.371611),(0.534566, 0.655235),(0.0940615, 0.0804537),(0.144657, 0.1807),(0.686163, -0.183549),(0.0666358, -0.78829),(0.048166, -0.614518),(-0.775314, 0.178328),(-0.233744, -0.329093),(0.0194269, -0.946401),(0.319482, -0.392283),(-0.259729, 0.127835),(-0.271622, 0.149306),(-0.195459, -0.149715),(-0.969015, 0.0295603),(-0.234351, -0.952508),(-0.805013, 0.307368),(-0.514304, -0.167411),(0.0905808, 0.505123),(-0.113812, -0.33159),(0.493245, -0.79433),(0.276128, -0.766483),(0.382823, 0.0897294),(-0.359594, -0.097788),(-0.265503, -0.722306),(0.882202, -0.0705154),(0.349158, -0.929242),(-0.218875, -0.560261),(0.57588, 0.667313),(0.108149, 0.0691257),(0.302642, 0.206488),(-0.611218, -0.314535),(-0.703782, -0.343769),(-0.12717, -0.763768),(-0.732923, 0.00939224),(-0.792768, -0.0925166),(0.108834, -0.353899),

Thread3:125, 100

Points inside the square: (-0.496582, -0.00896348),(0.575586, -0.911519),(-0.0604279, -0.0752559),(-0.840761, 0.720697),(0.364483, 0.735119),(0.38801, -0.527368),(-0.195755, 0.260992),(-0.143092, -0.893113),(-0.532519, 0.24569),(-0.207648, -0.236302),(0.901921, 0.665182),(-6.92862e-05, -0.831002),(-0.325426, 0.207163),(0.0764811, -0.413822),(0.432888, -0.814684),(0.23228, 0.936306),(0.176352, -0.192134),(-0.975213, -0.884076),(0.73261, -0.815975),(0.836621, 0.097093),(0.919144, 0.224631),(0.569725, -0.276611),(-0.514377, -0.573367),(-0.169724, -0.0468964),(0.672323, 0.622628),(0.716802, 0.574244),(0.28781, -0.283267),(0.743242, 0.962384),(0.923896, -0.180277),(-0.451437, 0.356783),(0.00503828, 0.780843),(0.293089, -0.81861),(-0.411291, 0.317876),(-0.702686, -0.678681),(0.501902, -0.866065),(0.418412, 0.421046),(0.358566, -0.0118633),(-0.855565, 0.844189),(0.41477, -0.0252895),(-0.202707, 0.0870927),(-0.402661, -0.485905),(-0.338663, 0.885149),(0.230827, -0.595422),(0.847533, 0.154723),(0.224301, -0.603904),(-0.488493, -0.770661),(-0.823061, 0.804596),(-0.58927, -0.234353),(0.122472, -0.291956),(0.0869663, -0.375626),(-0.15802, -0.494622),(-0.95458, -0.799454),(0.493515, -0.810146),(-0.955265, -0.0917154),(0.164565, -0.157973),(0.995377, 0.761903),(0.356122, -0.343286),(0.647052, -0.413051),(0.0612921, 0.494585),(0.741672, -0.714407),(0.890681, -0.746821),(-0.485068, -0.93238),(-0.942225, -0.0743381),(-0.166733, 0.180247),(0.633706, 0.920233),(0.804621, -0.524315),(-0.574389, 0.85004),(-0.323769, 0.919126),(-0.960105, -0.279034),(-0.172589, 0.204459),(0.562993, -0.177212),(-0.0336374, -0.0808849),(0.479502, -0.386586),(0.506064, -0.459206),(-0.892001, 0.247737),(-0.173613, 0.99868),(0.500916, 0.34132),(-0.9337, 0.558691),(-0.733018, -0.100433),(-0.261062, 0.900688),(-0.1802, -0.456441),(-0.623627, 0.245411),(-0.606401, 0.0526043),(0.164538, -0.566506),(0.77357, 0.991949),(0.637953, 0.336563),(-0.185263, -0.395684),(-0.744322, -0.705761),(0.21773, 0.761743),(-0.164966, 0.32573),(0.00947949, 0.661421),(0.32441, -0.489605),(0.00274115, 0.39071),(-0.930914, 0.269723),(-0.709723, -0.191977),(0.170411, 0.110077),(0.351582, 0.546784),(-0.644512, 0.745181),(-0.400612, 0.520026),(-0.821325, -0.627042),(0.511975, 0.816628),(0.709522, -0.673288),(-0.579056, 0.9652),(-0.379049, 0.638674),(0.726943, 0.455985),(-0.0355959, -0.263578),(0.117406, -0.711186),(0.246817, -0.879852),(0.679524, 0.315903),(0.389871, 0.9698),(-0.876074, -0.439719),(0.0798769, 0.475509),(-0.892935, 0.435365),(0.22069, -0.293547),(-0.0446091, 0.399365),(0.0794118, -0.532634),(0.215993, -0.211067),(-0.205922, 0.636938),(-0.245867, 0.415029),(0.275612, -0.518924),(-0.128986, -0.759984),(0.217498, 0.988421),(-0.47117, -0.535685),(-0.891432, -0.791646),(0.780218, 0.498439),

Points inside the circle: (-0.496582, -0.00896348),(-0.0604279, -0.0752559),(0.364483, 0.735119),(0.38801, -0.527368),(-0.195755, 0.260992),(-0.143092, -0.893113),(-0.532519, 0.24569),(-0.207648, -0.236302),(-6.92862e-05, -0.831002),(-0.325426, 0.207163),(0.0764811, -0.413822),(0.432888, -0.814684),(0.23228, 0.936306),(0.176352, -0.192134),(0.836621, 0.097093),(0.919144, 0.224631),(0.569725, -0.276611),(-0.514377, -0.573367),(-0.169724, -0.0468964),(0.672323, 0.622628),(0.716802, 0.574244),(0.28781, -0.283267),(0.923896, -0.180277),(-0.451437, 0.356783),(0.00503828, 0.780843),(0.293089, -0.81861),(-0.411291, 0.317876),(-0.702686, -0.678681),(0.418412, 0.421046),(0.358566, -0.0118633),(0.41477, -0.0252895),(-0.202707, 0.0870927),(-0.402661, -0.485905),(-0.338663, 0.885149),(0.230827, -0.595422),(0.847533, 0.154723),(0.224301, -0.603904),(-0.488493, -0.770661),(-0.58927, -0.234353),(0.122472, -0.291956),(0.0869663, -0.375626),(-0.15802, -0.494622),(0.493515, -0.810146),(-0.955265, -0.0917154),(0.164565, -0.157973),(0.356122, -0.343286),(0.647052, -0.413051),(0.0612921, 0.494585),(-0.942225, -0.0743381),(-0.166733, 0.180247),(0.804621, -0.524315),(-0.323769, 0.919126),(-0.960105, -0.279034),(-0.172589, 0.204459),(0.562993, -0.177212),(-0.0336374, -0.0808849),(0.479502, -0.386586),(0.506064, -0.459206),(-0.892001, 0.247737),(0.500916, 0.34132),(-0.733018, -0.100433),(-0.261062, 0.900688),(-0.1802, -0.456441),(-0.623627, 0.245411),(-0.606401, 0.0526043),(0.164538, -0.566506),(0.637953, 0.336563),(-0.185263, -0.395684),(0.21773, 0.761743),(-0.164966, 0.32573),(0.00947949, 0.661421),(0.32441, -0.489605),(0.00274115, 0.39071),(-0.930914, 0.269723),(-0.709723, -0.191977),(0.170411, 0.110077),(0.351582, 0.546784),(-0.644512, 0.745181),(-0.400612, 0.520026),(0.511975, 0.816628),(0.709522, -0.673288),(-0.379049, 0.638674),(0.726943, 0.455985),(-0.0355959, -0.263578),(0.117406, -0.711186),(0.246817, -0.879852),(0.679524, 0.315903),(-0.876074, -0.439719),(0.0798769, 0.475509),(-0.892935, 0.435365),(0.22069, -0.293547),(-0.0446091, 0.399365),(0.0794118, -0.532634),(0.215993, -0.211067),(-0.205922, 0.636938),(-0.245867, 0.415029),(0.275612, -0.518924),(-0.128986, -0.759984),(-0.47117, -0.535685),(0.780218, 0.498439),

Thread4:125, 104

Points inside the square: (-0.821846, 0.904145),(-0.94128, 0.258031),(0.379653, -0.834215),(-0.306604, -0.399657),(-0.127762, 0.648787),(0.999708, 0.95165),(-0.883847, 0.215701),(-0.259417, -0.0897697),(-0.147361, 0.494717),(-0.674741, -0.871749),(0.975793, 0.196273),(-0.631733, 0.193291),(0.184694, -0.102903),(0.657606, 0.293262),(0.105451,

0.437824),(-0.208299, 0.283605),(0.341969, -0.14958),(-0.458364, -0.278378),(0.0162055, 0.235032),(0.321965, 0.888444),(-0.116181, 0.321673),(0.840094, -2.85204e-05),(-0.462625, -0.419323),(0.910202, 0.390014),(-0.924606, -0.764539),(0.518265, -0.948813),(0.431734, 0.886532),(0.244477, -0.383572),(-0.216371, -0.0979165),(0.90969, 0.88908),(-0.660092, -0.298609),(0.172684, 0.681877),(0.551811, 0.71432),(-0.596501, -0.431983),(-0.0506479, 0.725464),(-0.543539, 0.833171),(0.0471376, -0.703445),(-0.166858, 0.584512),(-0.122768, -0.256656),(-0.0254736, -0.0473736),(-0.0211948, -0.507209),(0.00381317, -0.58946),(-0.620677, -0.751709),(0.026968, 0.162952),(0.150374, -0.0633417),(0.0520315, 0.490282),(0.638049, -0.775284),(0.172159, 0.189861),(0.939036, 0.575658),(0.757878, -0.111612),(0.301122, -0.785662),(-0.278441, -0.651741),(-0.489107, 0.554702),(0.932772, 0.388125),(-0.701954, -0.0927017),(-0.659248, 0.276851),(0.40009, 0.344565),(0.687391, 0.779413),(0.592855, -0.285641),(-0.0576355, -0.25677),(0.651017, 0.994396),(-0.766488, 0.289066),(-0.780888, 0.40567),(-0.521073, -0.841852),(-0.0186722, -0.763195),(0.0465361, -0.71755),(-0.548857, 0.768095),(-0.369291, -0.0379637),(0.322797, -0.436519),(-0.649838, 0.620843),(0.470779, -0.309087),(-0.102306, -0.129131),(-0.964522, -0.414916),(-0.349719, 0.628334),(0.299443, 0.592646),(-0.628437, -0.0495398),(0.587042, -0.394925),(-0.760474, 0.806154),(-0.989255, -0.281546),(0.964302, -0.00792717),(-0.0447417, 0.0108376),(0.274522, 0.406401),(-0.221067, 0.905232),(-0.631562, -0.89827),(-0.531287, -0.281401),(0.722573, 0.939492),(0.409513, -0.379734),(-0.189639, 0.444991),(0.205351, 0.460642),(0.0733242, -0.495206),(0.053288, 0.444887),(0.455254, -0.35967),(-0.950038, 0.694781),(-0.553517, -0.939293),(-0.586766, -0.589215),(0.05278, 0.368492),(0.421623, -0.672697),(-0.225106, -0.799445),(-0.767466, 0.143332),(-0.697715, -0.298753),(0.861931, -0.975142),(-0.359261, 0.271443),(-0.354876, 0.451099),(-0.283566, 0.850475),(-0.0882585, 0.789758),(-0.644731, 0.96503),(0.234645, 0.810523),(-0.394641, 0.284608),(0.505304, 0.0518428),(0.345315, 0.918538),(0.462628, -0.601905),(0.287031, -0.11575),(-0.274603, -0.938075),(0.0848058, -0.0420685),(0.205256, 0.387091),(0.659178, 0.0671869),(0.411949, -0.700083),(-0.66137, -0.942927),(0.751016, 0.0550641),(0.907548, -0.337242),(-0.155178, -0.737183),(-0.372213, -0.920532),(-0.926659, 0.233147),(0.364075, 0.578645),(-0.715011, -0.29061),

Points inside the circle: (-0.94128, 0.258031),(0.379653, -0.834215),(-0.306604, -0.399657),(-0.127762, 0.648787),(-0.883847, 0.215701),(-0.259417, -0.0897697),(-0.147361, 0.494717),(0.975793, 0.196273),(-0.631733, 0.193291),(0.184694, -0.102903),(0.657606,

0.293262),(0.105451, 0.437824),(-0.208299, 0.283605),(0.341969, -0.14958),(-0.458364,
-0.278378),(0.0162055, 0.235032),(0.321965, 0.888444),(-0.116181, 0.321673),(0.840094,
-2.85204e-05),(-0.462625, -0.419323),(0.910202, 0.390014),(0.431734, 0.886532),(0.244477,
-0.383572),(-0.216371, -0.0979165),(-0.660092, -0.298609),(0.172684, 0.681877),(0.551811,
0.71432),(-0.596501, -0.431983),(-0.0506479, 0.725464),(-0.543539, 0.833171),(0.0471376,
-0.703445),(-0.166858, 0.584512),(-0.122768, -0.256656),(-0.0254736,
-0.0473736),(-0.0211948, -0.507209),(0.00381317, -0.58946),(-0.620677,
-0.751709),(0.026968, 0.162952),(0.150374, -0.0633417),(0.0520315, 0.490282),(0.172159,
0.189861),(0.757878, -0.111612),(0.301122, -0.785662),(-0.278441, -0.651741),(-0.489107,
0.554702),(-0.701954, -0.0927017),(-0.659248, 0.276851),(0.40009, 0.344565),(0.592855,
-0.285641),(-0.0576355, -0.25677),(-0.766488, 0.289066),(-0.780888, 0.40567),(-0.521073,
-0.841852),(-0.0186722, -0.763195),(0.0465361, -0.71755),(-0.548857, 0.768095),(-0.369291,
-0.0379637),(0.322797, -0.436519),(-0.649838, 0.620843),(0.470779, -0.309087),(-0.102306,
-0.129131),(-0.349719, 0.628334),(0.299443, 0.592646),(-0.628437, -0.0495398),(0.587042,
-0.394925),(0.964302, -0.00792717),(-0.0447417, 0.0108376),(0.274522,
0.406401),(-0.221067, 0.905232),(-0.531287, -0.281401),(0.409513, -0.379734),(-0.189639,
0.444991),(0.205351, 0.460642),(0.0733242, -0.495206),(0.053288, 0.444887),(0.455254,
-0.35967),(-0.586766, -0.589215),(0.05278, 0.368492),(0.421623, -0.672697),(-0.225106,
-0.799445),(-0.767466, 0.143332),(-0.697715, -0.298753),(-0.359261, 0.271443),(-0.354876,
0.451099),(-0.283566, 0.850475),(-0.0882585, 0.789758),(0.234645, 0.810523),(-0.394641,
0.284608),(0.505304, 0.0518428),(0.345315, 0.918538),(0.462628, -0.601905),(0.287031,
-0.11575),(-0.274603, -0.938075),(0.0848058, -0.0420685),(0.205256, 0.387091),(0.659178,
0.0671869),(0.411949, -0.700083),(0.751016, 0.0550641),(0.907548, -0.337242),(-0.155178,
-0.737183),(-0.372213, -0.920532),(-0.926659, 0.233147),(0.364075, 0.578645),(-0.715011,
-0.29061),

Thread5:125, 89

Points inside the square: (-0.153862, 0.716673),(-0.209186, -0.948606),(0.103764,
-0.550008),(0.118581, -0.484287),(-0.250091, 0.457211),(-0.427214, -0.499075),(-0.487725,
-0.519665),(0.163683, 0.357097),(-0.256848, 0.791471),(0.436565, -0.183508),(0.0246173,
-0.19936),(-0.604863, 0.309607),(0.51003, 0.89232),(0.0572239, -0.382485),(-0.323467,
0.689091),(-0.549602, 0.522671),(0.405765, 0.241211),(0.574065, -0.490471),(0.691204,
-0.307354),(0.0252421, -0.558887),(-0.850143, 0.598028),(-0.0579621, -0.337868),(-0.921637,

-0.894279),(-0.980771, -0.178485),(0.897192, 0.455794),(0.638007, -0.0781909),(-0.743566,
-0.966856),(-0.768584, 0.766464),(0.925464, 0.28864),(-0.616021, -0.398003),(-0.022269,
-0.165623),(-0.875332, -0.616504),(-0.924412, 0.698733),(-0.106976, 0.766792),(-0.608622,
0.918267),(-0.792096, -0.458765),(0.516295, 0.149942),(0.203367, 0.594658),(0.255663,
0.222596),(-0.583827, 0.152855),(-0.321611, -0.945819),(-0.925336, -0.0651767),(-0.912675,
-0.69392),(-0.298713, -0.987211),(0.59472, 0.0852666),(-0.385214, -0.427549),(0.919643,
-0.260546),(-0.0440535, 0.995232),(-0.561813, 0.848971),(0.762024, -0.170435),(0.767237,
0.969928),(0.3708, 0.283532),(0.11987, -0.425833),(-0.121809, -0.624466),(0.796763,
0.294364),(0.528389, -0.524848),(0.348544, 0.603053),(0.409976, 0.435869),(0.909133,
-0.888737),(0.448658, 0.503853),(0.19653, -0.936556),(-0.923696, 0.116173),(-0.197101,
0.0322506),(0.111405, 0.241086),(-0.118778, -0.126572),(-0.929349, -0.351541),(-0.156644,
0.441451),(0.931991, 0.963227),(-0.984381, -0.189818),(-0.66124, 0.812382),(-0.895454,
0.867149),(-0.712466, 0.45309),(0.470203, 0.69751),(-0.111041, 0.379336),(0.808773,
-0.662382),(-0.116811, 0.00530217),(-0.598938, -0.0405066),(-0.878525,
0.203961),(0.991744, 0.23288),(-0.554954, -0.127034),(-0.893691, -0.484303),(0.521425,
-0.050335),(0.957149, 0.453416),(-0.0871084, 0.972767),(-0.736402, 0.251652),(0.785149,
-0.631856),(0.118801, -0.927317),(0.821234, -0.410996),(0.770193, -0.289807),(0.96834,
0.578965),(0.047811, -0.148471),(-0.415733, 0.448873),(0.811022, -0.294257),(-0.347166,
0.802766),(0.938623, 0.0978803),(-0.324268, -0.955069),(0.613578, -0.802843),(-0.00540367,
0.570726),(0.650573, 0.907488),(0.543494, 0.914171),(0.15914, 0.328643),(-0.717685,
-0.722059),(0.401326, -0.896452),(-0.133056, 0.171518),(-0.186258, -0.164716),(-0.249517,
0.861553),(0.686813, 0.334751),(0.310426, 0.497835),(-0.959507, 0.96326),(0.300601,
0.979116),(0.0611402, 0.976333),(-0.975953, -0.325282),(-0.82651, 0.0186436),(-0.754556,
0.824062),(-0.0738685, 0.788938),(0.738233, -0.914729),(0.11758, 0.905082),(0.589068,
-0.29146),(-0.333298, 0.13477),(-0.708654, 0.93629),(0.112882, -0.735363),(-0.537218,
0.55518),(0.788564, 0.30431),(-0.0829727, -0.0499638),(-0.990358, -0.255324),

Points inside the circle: (-0.153862, 0.716673),(-0.209186, -0.948606),(0.103764,
-0.550008),(0.118581, -0.484287),(-0.250091, 0.457211),(-0.427214, -0.499075),(-0.487725,
-0.519665),(0.163683, 0.357097),(-0.256848, 0.791471),(0.436565, -0.183508),(0.0246173,
-0.19936),(-0.604863, 0.309607),(0.0572239, -0.382485),(-0.323467, 0.689091),(-0.549602,
0.522671),(0.405765, 0.241211),(0.574065, -0.490471),(0.691204, -0.307354),(0.0252421,
-0.558887),(-0.0579621, -0.337868),(-0.980771, -0.178485),(0.638007, -0.0781909),(0.925464,

0.28864),(-0.616021, -0.398003),(-0.022269, -0.165623),(-0.106976, 0.766792),(-0.792096, -0.458765),(0.516295, 0.149942),(0.203367, 0.594658),(0.255663, 0.222596),(-0.583827, 0.152855),(-0.321611, -0.945819),(-0.925336, -0.0651767),(0.59472, 0.0852666),(-0.385214, -0.427549),(0.919643, -0.260546),(-0.0440535, 0.995232),(0.762024, -0.170435),(0.3708, 0.283532),(0.11987, -0.425833),(-0.121809, -0.624466),(0.796763, 0.294364),(0.528389, -0.524848),(0.348544, 0.603053),(0.409976, 0.435869),(0.448658, 0.503853),(0.19653, -0.936556),(-0.923696, 0.116173),(-0.197101, 0.0322506),(0.111405, 0.241086),(-0.118778, -0.126572),(-0.929349, -0.351541),(-0.156644, 0.441451),(-0.712466, 0.45309),(0.470203, 0.69751),(-0.111041, 0.379336),(-0.116811, 0.00530217),(-0.598938, -0.0405066),(-0.878525, 0.203961),(-0.554954, -0.127034),(0.521425, -0.050335),(-0.0871084, 0.972767),(-0.736402, 0.251652),(0.118801, -0.927317),(0.821234, -0.410996),(0.770193, -0.289807),(0.047811, -0.148471),(-0.415733, 0.448873),(0.811022, -0.294257),(-0.347166, 0.802766),(0.938623, 0.0978803),(-0.00540367, 0.570726),(0.15914, 0.328643),(0.401326, -0.896452),(-0.133056, 0.171518),(-0.186258, -0.164716),(-0.249517, 0.861553),(0.686813, 0.334751),(0.310426, 0.497835),(0.0611402, 0.976333),(-0.82651, 0.0186436),(-0.0738685, 0.788938),(0.11758, 0.905082),(0.589068, -0.29146),(-0.333298, 0.13477),(0.112882, -0.735363),(-0.537218, 0.55518),(0.788564, 0.30431),(-0.0829727, -0.0499638),

Thread6:125, 99

Points inside the square: (0.497183, 0.747617),(0.107485, -0.215787),(-0.368133, 0.832882),(-0.979452, -0.636788),(-0.481094, -0.875904),(0.230157, 0.690424),(-0.0621621, -0.934559),(-0.559092, -0.200609),(0.752254, 0.775658),(-0.890183, 0.250089),(0.816151, -0.926923),(-0.44931, 0.795267),(0.134217, -0.472977),(0.819315, 0.808935),(-0.299487, -0.162042),(-0.945621, -0.475424),(0.76409, 0.843317),(-0.737191, 0.849361),(-0.039103, -0.716644),(-0.787427, 0.479803),(-0.592548, 0.44273),(0.170227, 0.34529),(0.50817, 0.611135),(-0.855319, 0.260424),(0.386793, -0.745502),(-0.489487, 0.202945),(-0.672426, 0.0612027),(-0.00178797, 0.461791),(0.588226, -0.182473),(0.270726, -0.711261),(0.655485, 0.325105),(-0.186685, 0.419575),(0.168421, 0.0761237),(0.268936, -0.870682),(0.35948, 0.481509),(0.609121, 0.766933),(-0.0757616, -0.220651),(0.112223, -0.567591),(-0.609516, 0.256904),(0.692833, 0.777277),(0.511402, -0.796655),(-0.0197783, 0.838976),(0.264548, 0.978434),(0.300767, -0.147226),(-0.20404, -0.428507),(0.141513, -0.548555),(0.896597, 0.954828),(0.87102, 0.0650185),(0.0309522, 0.139955),(0.194337, -0.609568),(-0.378536, -0.196542),(-0.842635, 0.545703),(0.582807, 0.269588),(0.978111, 0.97329),(-0.473508,

0.670944),(0.750567, -0.962107),(0.874289, -0.269211),(0.876869, 0.138837),(-0.290777, 0.177636),(0.991611, 0.505183),(0.749129, 0.133125),(0.956628, 0.645727),(0.0879532, 0.827648),(-0.289255, -0.881095),(-0.0323964, -0.490662),(-0.216174, -0.984796),(-0.499325, -0.341885),(-0.254007, -0.622456),(0.796952, 0.455216),(-0.039601, -0.0783115),(0.660781, -0.871453),(0.712279, 0.565863),(-0.362115, 0.301347),(-0.725597, 0.304587),(-0.563883, -0.434251),(0.240877, 0.548999),(-0.169614, 0.703659),(-0.667175, -0.15441),(-0.795666, -0.0090604),(0.591583, -0.418122),(-0.212108, 0.0467991),(-0.862942, -0.423544),(-0.992802, 0.441368),(0.498144, -0.0757746),(-0.608596, 0.507786),(0.668901, -0.947815),(0.636333, 0.38118),(0.618048, -0.725782),(-0.317473, 0.892451),(0.578805, 0.118644),(-0.5418, -0.180318),(-0.332357, 0.288586),(-0.476659, 0.000467398),(-0.865824, -0.272325),(0.991407, 0.72576),(0.309552, -0.220701),(-0.227441, 0.446611),(0.355755, -0.220243),(-0.112022, -0.146101),(0.703982, 0.279382),(-0.638315, 0.372883),(0.331567, 0.998018),(-0.245937, -0.0503849),(-0.727765, 0.43659),(-0.157934, 0.85104),(-0.444766, 0.300267),(-0.329277, 0.222877),(-0.411147, 0.194064),(-0.776656, -0.276971),(0.921738, -0.785249),(-0.551211, 0.231291),(-0.00594971, 0.221348),(-0.322099, -0.650195),(-0.998895, 0.565879),(0.203704, 0.705087),(-0.154739, 0.565389),(0.0779703, -0.823172),(0.563406, 0.832033),(0.126443, 0.835642),(0.268624, 0.96851),(0.686682, 0.823858),(0.268776, -0.642595),(0.0467345, 0.857629),(0.551468, 0.270079),(-0.419341, 0.473207),

Points inside the circle: (0.497183, 0.747617),(0.107485, -0.215787),(-0.368133, 0.832882),(-0.481094, -0.875904),(0.230157, 0.690424),(-0.0621621, -0.934559),(-0.559092, -0.200609),(-0.890183, 0.250089),(-0.44931, 0.795267),(0.134217, -0.472977),(-0.299487, -0.162042),(-0.039103, -0.716644),(-0.787427, 0.479803),(-0.592548, 0.44273),(0.170227, 0.34529),(0.50817, 0.611135),(-0.855319, 0.260424),(0.386793, -0.745502),(-0.489487, 0.202945),(-0.672426, 0.0612027),(-0.00178797, 0.461791),(0.588226, -0.182473),(0.270726, -0.711261),(0.655485, 0.325105),(-0.186685, 0.419575),(0.168421, 0.0761237),(0.268936, -0.870682),(0.35948, 0.481509),(0.609121, 0.766933),(-0.0757616, -0.220651),(0.112223, -0.567591),(-0.609516, 0.256904),(0.511402, -0.796655),(-0.0197783, 0.838976),(0.300767, -0.147226),(-0.20404, -0.428507),(0.141513, -0.548555),(0.87102, 0.0650185),(0.0309522, 0.139955),(0.194337, -0.609568),(-0.378536, -0.196542),(0.582807, 0.269588),(-0.473508, 0.670944),(0.874289, -0.269211),(0.876869, 0.138837),(-0.290777, 0.177636),(0.749129, 0.133125),(0.0879532, 0.827648),(-0.289255, -0.881095),(-0.0323964, -0.490662),(-0.499325, -0.341885),(-0.254007, -0.622456),(0.796952, 0.455216),(-0.039601, -0.0783115),(0.712279,

0.565863),(-0.362115, 0.301347),(-0.725597, 0.304587),(-0.563883, -0.434251),(0.240877, 0.548999),(-0.169614, 0.703659),(-0.667175, -0.15441),(-0.795666, -0.0090604),(0.591583, -0.418122),(-0.212108, 0.0467991),(-0.862942, -0.423544),(0.498144, -0.0757746),(-0.608596, 0.507786),(0.636333, 0.38118),(0.618048, -0.725782),(-0.317473, 0.892451),(0.578805, 0.118644),(-0.5418, -0.180318),(-0.332357, 0.288586),(-0.476659, 0.000467398),(-0.865824, -0.272325),(0.309552, -0.220701),(-0.227441, 0.446611),(0.355755, -0.220243),(-0.112022, -0.146101),(0.703982, 0.279382),(-0.638315, 0.372883),(-0.245937, -0.0503849),(-0.727765, 0.43659),(-0.157934, 0.85104),(-0.444766, 0.300267),(-0.329277, 0.222877),(-0.411147, 0.194064),(-0.776656, -0.276971),(-0.551211, 0.231291),(-0.00594971, 0.221348),(-0.322099, -0.650195),(0.203704, 0.705087),(-0.154739, 0.565389),(0.0779703, -0.823172),(0.126443, 0.835642),(0.268776, -0.642595),(0.0467345, 0.857629),(0.551468, 0.270079),(-0.419341, 0.473207),

Thread7:125, 100

Points inside the square: (0.48483, 0.0294479),(-0.295503, -0.52112),(-0.749204, 0.382399),(-0.171315, -0.748099),(-0.0517221, -0.967611),(0.956988, 0.793539),(0.597778, 0.0349584),(0.970367, 0.161184),(-0.133008, 0.0968108),(-0.00317397, -0.864385),(0.0653204, -0.316492),(0.959473, -0.665903),(0.040913, 0.00620747),(-0.808274, -0.407619),(-0.723714, -0.227615),(-0.934412, 0.761116),(0.801833, -0.229915),(-0.760003, -0.947371),(-0.847516, 0.0686824),(-0.695471, 0.100762),(0.101072, -0.738483),(-0.105699, -0.301151),(0.296476, -0.135332),(0.860034, -0.836532),(0.961479, -0.14314),(-0.700917, 0.0267995),(0.540368, -0.741444),(0.360896, -0.418719),(0.264763, 0.552622),(0.173662, 0.54105),(-0.674993, 0.23925),(0.302166, -0.873161),(-0.990665, 0.542163),(-0.820532, -0.838181),(-0.389154, -0.516003),(0.26258, 0.711917),(-0.254485, -0.843119),(-0.589233, -0.95801),(0.021549, -0.7292),(-0.794542, -0.0169719),(0.12766, -0.495459),(-0.990172, -0.331972),(-0.236903, 0.370724),(0.249309, -0.972139),(-0.0766543, -0.577029),(0.56891, 0.248352),(0.662221, -0.128923),(0.375192, 0.671556),(-0.58676, 0.554659),(0.833374, 0.0240853),(-0.961343, 0.0959543),(-0.263998, -0.215829),(0.252835, 0.146769),(-0.173838, -0.725616),(0.417569, 0.0316199),(0.257412, -0.454771),(0.536161, 0.26724),(0.213257, -0.700742),(-0.362037, -0.537434),(-0.672881, 0.561309),(-0.114463, 0.896029),(-0.190339, -0.452242),(-0.232894, -0.815147),(-0.780686, 0.180345),(0.739513, -0.947312),(-0.795569, 0.778169),(0.148642, -0.0595669),(-0.437659, -0.598523),(-0.912798, 0.388502),(-0.324139, 0.504772),(-0.579878, 0.933274),(-0.949999, 0.956283),(0.200513, 0.263258),(-0.744458,

0.838477),(0.725824, -0.41734),(0.399786, -0.388639),(-0.521311, -0.790553),(0.159119, 0.245795),(-0.6057, 0.378433),(-0.57386, -0.866187),(0.431121, -0.369429),(0.911982, -0.420237),(0.571004, -0.525677),(-0.0187599, 0.658206),(0.862825, 0.657101),(0.162978, -0.717052),(0.590375, 0.212979),(-0.760769, -0.209112),(-0.523763, -0.505227),(-0.370635, -0.797939),(0.0774327, -0.970849),(-0.186577, 0.556122),(-0.761402, 0.972542),(-0.198083, -0.367102),(0.350975, 0.228057),(-0.233289, -0.217905),(0.858628, -0.321306),(0.361858, 0.429632),(0.153017, -0.656902),(0.0878384, 0.0158421),(-0.9998, -0.749184),(0.29879, 0.590575),(0.463795, 0.538021),(-0.618537, 0.940032),(-0.967207, 0.010828),(-0.857906, 0.110226),(0.0399787, -0.0444836),(-0.333652, 0.278577),(-0.0719416, 0.468265),(0.911475, -0.720967),(-0.303678, -0.321814),(0.0611283, -0.44505),(0.35688, -0.577014),(0.984582, -0.490103),(-0.233916, 0.0724209),(0.525739, -0.233716),(0.323237, -0.175471),(-0.643141, -0.212968),(-0.637451, -0.261678),(-0.272935, -0.604657),(0.74915, -0.130842),(0.505569, -0.210872),(0.824675, -0.828083),(-0.932295, -0.247267),(0.640182, 0.97918),

Points inside the circle: (0.48483, 0.0294479),(-0.295503, -0.52112),(-0.749204, 0.382399),(-0.171315, -0.748099),(-0.0517221, -0.967611),(0.597778, 0.0349584),(0.970367, 0.161184),(-0.133008, 0.0968108),(-0.00317397, -0.864385),(0.0653204, -0.316492),(0.040913, 0.00620747),(-0.808274, -0.407619),(-0.723714, -0.227615),(0.801833, -0.229915),(-0.847516, 0.0686824),(-0.695471, 0.100762),(0.101072, -0.738483),(-0.105699, -0.301151),(0.296476, -0.135332),(0.961479, -0.14314),(-0.700917, 0.0267995),(0.540368, -0.741444),(0.360896, -0.418719),(0.264763, 0.552622),(0.173662, 0.54105),(-0.674993, 0.23925),(0.302166, -0.873161),(-0.389154, -0.516003),(0.26258, 0.711917),(-0.254485, -0.843119),(0.021549, -0.7292),(-0.794542, -0.0169719),(0.12766, -0.495459),(-0.236903, 0.370724),(-0.0766543, -0.577029),(0.56891, 0.248352),(0.662221, -0.128923),(0.375192, 0.671556),(-0.58676, 0.554659),(0.833374, 0.0240853),(-0.961343, 0.0959543),(-0.263998, -0.215829),(0.252835, 0.146769),(-0.173838, -0.725616),(0.417569, 0.0316199),(0.257412, -0.454771),(0.536161, 0.26724),(0.213257, -0.700742),(-0.362037, -0.537434),(-0.672881, 0.561309),(-0.114463, 0.896029),(-0.190339, -0.452242),(-0.232894, -0.815147),(-0.780686, 0.180345),(0.148642, -0.0595669),(-0.437659, -0.598523),(-0.912798, 0.388502),(-0.324139, 0.504772),(0.200513, 0.263258),(0.725824, -0.41734),(0.399786, -0.388639),(-0.521311, -0.790553),(0.159119, 0.245795),(-0.6057, 0.378433),(0.431121, -0.369429),(0.571004, -0.525677),(-0.0187599, 0.658206),(0.162978, -0.717052),(0.590375, 0.212979),(-0.760769, -0.209112),(-0.523763, -0.505227),(-0.370635, -0.797939),(0.0774327, -0.970849),(-0.186577,

0.556122),(-0.198083, -0.367102),(0.350975, 0.228057),(-0.233289, -0.217905),(0.858628, -0.321306),(0.361858, 0.429632),(0.153017, -0.656902),(0.0878384, 0.0158421),(0.29879, 0.590575),(0.463795, 0.538021),(-0.967207, 0.010828),(-0.857906, 0.110226),(0.0399787, -0.0444836),(-0.333652, 0.278577),(-0.0719416, 0.468265),(-0.303678, -0.321814),(0.0611283, -0.44505),(0.35688, -0.577014),(-0.233916, 0.0724209),(0.525739, -0.233716),(0.323237, -0.175471),(-0.643141, -0.212968),(-0.637451, -0.261678),(-0.272935, -0.604657),(0.74915, -0.130842),(0.505569, -0.210872),(-0.932295, -0.247267),

Thread8:125, 103

Points inside the square: (0.0317661, -0.663496),(-0.342634, -0.907106),(-0.108546, -0.985754),(-0.484119, -0.123963),(-0.475857, 0.281965),(0.948458, -0.950118),(-0.951751, 0.271695),(-0.125589, -0.594892),(-0.941273, 0.23696),(0.143429, -0.214208),(0.632303, -0.107421),(0.65495, 0.137872),(0.681707, 0.479625),(0.309789, 0.749412),(-0.767642, -0.050029),(0.728592, 0.264124),(0.286475, -0.614042),(0.357019, -0.82207),(-0.599796, 0.872899),(0.0539665, -0.0756524),(0.154864, 0.00242436),(-0.0257702, 0.203113),(-0.725881, 0.848641),(0.608221, -0.667153),(0.0856013, -0.24835),(0.118639, -0.282095),(0.644229, -0.226411),(0.855777, 0.325936),(-0.746786, 0.165566),(0.0753476, -0.514427),(-0.884463, -0.196061),(0.749697, 0.402012),(0.189897, 0.106716),(0.579941, 0.590101),(-0.0203848, -0.366092),(-0.485551, -0.86552),(0.636332, 0.488679),(0.337593, 0.910452),(0.33732, -0.0541857),(-0.756702, -0.577079),(0.697465, 0.361937),(0.140825, 0.341693),(-0.864473, -0.0033979),(-0.332371, -0.611259),(-0.837832, 0.742977),(-0.125686, -0.722296),(-0.453084, -0.375989),(0.679716, 0.736813),(0.730726, 0.259657),(0.326915, -0.289658),(0.893565, 0.841364),(-0.155179, 0.529897),(0.330043, -0.817586),(0.440349, -0.332638),(0.128229, 0.683647),(0.0902833, -0.174307),(0.0455848, -0.768891),(-0.832613, 0.181111),(0.227711, -0.164984),(0.569852, 0.389879),(-0.422007, -0.555834),(0.667583, 0.124909),(0.0681765, 0.347299),(-0.138278, -0.201097),(-0.393043, -0.811363),(0.509244, -0.499478),(-0.969999, -0.645934),(-0.969581, 0.360044),(-0.46352, 0.470768),(-0.972594, 0.664709),(0.154416, 0.117689),(-0.509598, -0.8),(0.348798, -0.342212),(0.381112, -0.423491),(0.492804, -0.0490359),(0.966387, -0.929203),(0.39513, 0.63397),(0.195706, -0.536694),(-0.0187306, -0.942571),(0.262209, 0.588226),(-0.753934, -0.228546),(-0.911252, -0.723933),(0.125519, -0.880833),(0.63611, 0.661999),(0.589935, 0.663516),(0.326708, -0.255649),(-0.218795, 0.81711),(-0.0556487, -0.869997),(-0.525102, -0.674537),(-0.293488, 0.967702),(0.276427, -0.327101),(-0.9615, -0.328443),(-0.693131, 0.234206),(0.134864,

0.288139),(0.291635, -0.602927),(-0.123635, 0.537701),(0.168527, -0.0348877),(0.813767, -0.705954),(0.0842792, 0.449878),(0.956045, -0.325786),(0.113394, 0.282753),(0.418565, 0.894599),(0.0998631, -0.637083),(-0.975397, 0.574761),(-0.31162, -0.268886),(0.542463, 0.964807),(0.404014, 0.580963),(-0.363636, 0.710883),(-0.184831, 0.771228),(-0.000978392, -0.893197),(-0.831699, 0.875386),(0.644504, 0.336828),(-0.159501, 0.458272),(0.630874, 0.924778),(-0.0918506, 0.586919),(-0.401008, -0.978457),(-0.130327, -0.982443),(0.916143, 0.969536),(-0.619526, 0.940745),(0.544297, 0.0688537),(-0.32814, 0.0867601),(0.0336607, -0.924127),(-0.332277, 0.670025),(0.786756, 0.482892),(0.441253, -0.214222),

Points inside the circle: (0.0317661, -0.663496),(-0.342634, -0.907106),(-0.108546, -0.985754),(-0.484119, -0.123963),(-0.475857, 0.281965),(-0.951751, 0.271695),(-0.125589, -0.594892),(-0.941273, 0.23696),(0.143429, -0.214208),(0.632303, -0.107421),(0.65495, 0.137872),(0.681707, 0.479625),(0.309789, 0.749412),(-0.767642, -0.050029),(0.728592, 0.264124),(0.286475, -0.614042),(0.357019, -0.82207),(0.0539665, -0.0756524),(0.154864, 0.00242436),(-0.0257702, 0.203113),(0.608221, -0.667153),(0.0856013, -0.24835),(0.118639, -0.282095),(0.644229, -0.226411),(0.855777, 0.325936),(-0.746786, 0.165566),(0.0753476, -0.514427),(-0.884463, -0.196061),(0.749697, 0.402012),(0.189897, 0.106716),(0.579941, 0.590101),(-0.0203848, -0.366092),(-0.485551, -0.86552),(0.636332, 0.488679),(0.337593, 0.910452),(0.33732, -0.0541857),(-0.756702, -0.577079),(0.697465, 0.361937),(0.140825, 0.341693),(-0.864473, -0.0033979),(-0.332371, -0.611259),(-0.125686, -0.722296),(-0.453084, -0.375989),(0.730726, 0.259657),(0.326915, -0.289658),(-0.155179, 0.529897),(0.330043, -0.817586),(0.440349, -0.332638),(0.128229, 0.683647),(0.0902833, -0.174307),(0.0455848, -0.768891),(-0.832613, 0.181111),(0.227711, -0.164984),(0.569852, 0.389879),(-0.422007, -0.555834),(0.667583, 0.124909),(0.0681765, 0.347299),(-0.138278, -0.201097),(-0.393043, -0.811363),(0.509244, -0.499478),(-0.46352, 0.470768),(0.154416, 0.117689),(-0.509598, -0.8),(0.348798, -0.342212),(0.381112, -0.423491),(0.492804, -0.0490359),(0.39513, 0.63397),(0.195706, -0.536694),(-0.0187306, -0.942571),(0.262209, 0.588226),(-0.753934, -0.228546),(0.125519, -0.880833),(0.63611, 0.661999),(0.589935, 0.663516),(0.326708, -0.255649),(-0.218795, 0.81711),(-0.0556487, -0.869997),(-0.525102, -0.674537),(0.276427, -0.327101),(-0.693131, 0.234206),(0.134864, 0.288139),(0.291635, -0.602927),(-0.123635, 0.537701),(0.168527, -0.0348877),(0.0842792, 0.449878),(0.113394, 0.282753),(0.418565, 0.894599),(0.0998631, -0.637083),(-0.31162, -0.268886),(0.404014, 0.580963),(-0.363636, 0.710883),(-0.184831, 0.771228),(-0.000978392, -0.893197),(0.644504, 0.336828),(-0.159501,

0.458272),(-0.0918506, 0.586919),(-0.130327, -0.982443),(0.544297, 0.0688537),(-0.32814, 0.0867601),(0.0336607, -0.924127),(-0.332277, 0.670025),(0.786756, 0.482892),(0.441253, -0.214222).

The output for other N and K values can also be obtained by the editing the input files.

Plot1 - Time taken vs Number of threads:

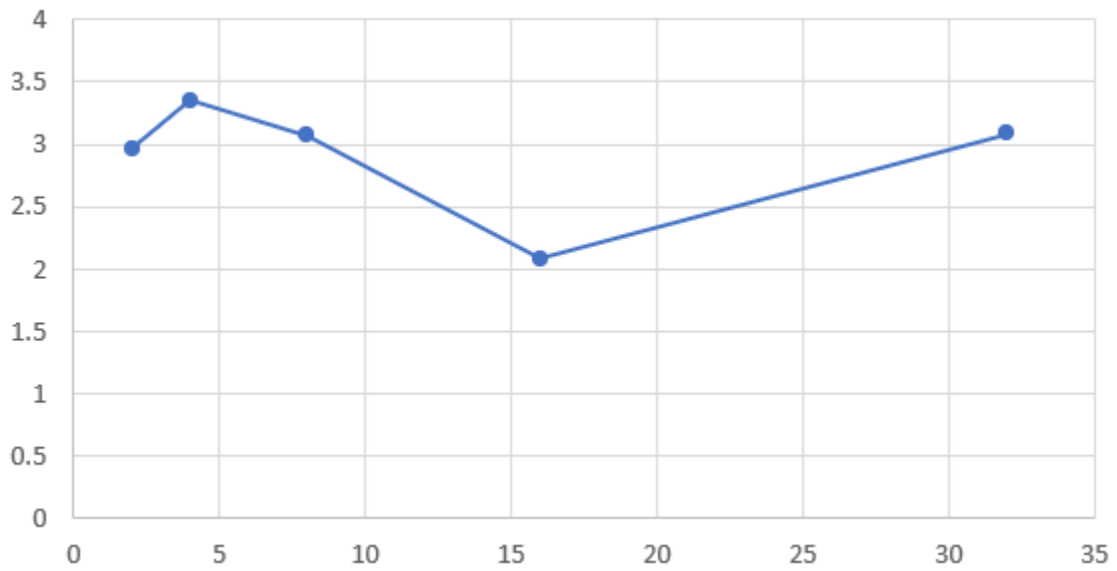
No. of input points are fixed to 6 million.

X axis: No. of threads

Y axis: Time taken

K(No. of threads) : X	Time(in seconds) : Y
2	2.96099
4	3.35171
8	3.069838
16	2.0755198
32	3.081864

Note: The above values of time are an average of five trails for the same no. of threads.



Plot2 - Time taken vs Number of initial points:

No. of threads are fixed to 32.

X axis: No. of points

Y axis: Time taken

N(No. of points in million) : X	Time(in seconds) : Y
1	0.3185552
2	0.9253944
3	1.353766
4	2.05075
5	2.622534

Note: The above values of time are an average of five trails for the same no. of points.

