Exercise 12. Answer Sheet

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Problem 1. (40 points) Implement the randomized algorithm for calculating π given in the lecture.
- Calculate π using your program 10 times using N number of points from the next table. Fill in the results you got.

N	1	2	3	4	5	6	7	8	9	10
1	4.000000	0.000000	0.000000	0.000000	4.000000	0.000000	4.000000	4.000000	4.000000	4.000000
10	3.600000	3.600000	3.600000	3.600000	3.200000	3.200000	2.400000	2.800000	2.800000	2.800000
100	3.280000	2.920000	3.400000	3.160000	3.240000	3.320000	3.120000	3.320000	3.160000	3.360000
1000	3.208000	3.100000	3.164000	3.152000	3.148000	3.080000	3.152000	3.072000	3.180000	3.204000
10000	3.138800	3.134800	3.157600	3.141200	3.164400	3.100400	3.121200	3.143200	3.118400	3.115200
100000	3.140320	3.147480	3.141040	3.140080	3.136080	3.132680	3.135520	3.144200	3.145280	3.135240

- Upload your code.

Problem 2. (60 points) Write a program implementing the quicksort algorithm. Make two versions:
a) Randomized quicksort, where the pivot element is chosen at random.
b) Deterministic quicksort, where the pivot element is always the first element of the array.

- Generate random sequence of length N (as given in the Table)
- Measure the time each quicksort version needs to sort the sequences (fill in the average of 100 runs).

N	100	1000	10000	100000	1000000
Randomized	0.000000	0.000000	0.020000	0.450000	6.570000
Deterministic	0.000000	0.000000	0.030000	0.530000	3.440000

- Upload your code.