System Programming Homework 5 Report

First of all I took size of matrixes from argument list. Then I created 4 matrixes. 2 of them holds values taken from files. 1 of them will hold multiplication of these two matrixes. And the last one will hold 2D discrete fourier transform of multiplication matrix.

After creating matrixes I created m number of threads. Each of them has an argument which is pointer to the threadArgs object. threadArgs structure holds pointers to 4 matrixes created earlier, id of thread, size of the matrixes, number of threads, and start and end indexes of columns the corresponding thread is responsible. Mutex and condition variable is initialized. These are global variables. When arguments are ready, I created threads.

Each thread takes argumens from the threadArgs structure and calls function which calculates multiplication results for columns the thread is responsible. Number of threads which finish its task is counted. Each thread which is not the last one which finishes its task calls pthread_cond_wait function and waits for the last thread to send signal. So that, when all threads completed the first task, they can start to the second task.

Second task calculates the 2D Discrete Fourier Transform of answer of first task.

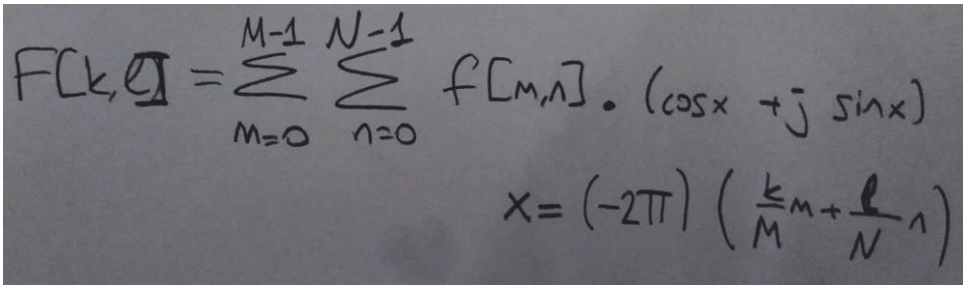
Formula:

$$F[k,l] = \sum_{m=0}^{M-1} \sum_{n=0}^{N-1} f[m,n] e^{-j2\pi\left(\frac{k}{M}m + \frac{l}{N}n\right)}$$

Using Euler's equation :

$$e^{ix} = \cos x + i \sin x$$

I converted the formula into :



And I made each thread find the columns it was responsible earlier. When all of them finish also their second task, program writes the answer to the output file.

Number of columns which each thread is responsible is calculated such that,

If number of columns % number of threads == N, then first N threads has 1 more column to calculate.

My computer has cpu which has 8 cores.

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mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 2
Two matrices of size 32x32 have been read. The number of threads is 2
Seconds: 0 Microseconds: 12763 Thread 1 has reached the rendezvous point in 0.012763 seconds
Seconds: 0 Microseconds: 12881 Thread 2 has reached the rendezvous point in 0.012881 seconds
Seconds: 0 Microseconds: 12972 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 13089 Thread 1 is advancing to the second part
Seconds: 1 Microseconds: -749988        Thread 2 has finished the second part in 0.237040 seconds.
Seconds: 1 Microseconds: -738569        Thread 1 has finished the second part in 0.248342 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.250285 seconds
Seconds: 1 Microseconds: -354253 The process has written the output file. The total time spent is 0.645747 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 4
Two matrices of size 32x32 have been read. The number of threads is 4
Seconds: 0 Microseconds: 11323 Thread 1 has reached the rendezvous point in 0.011323 seconds
Seconds: 0 Microseconds: 11570 Thread 2 has reached the rendezvous point in 0.011570 seconds
Seconds: 0 Microseconds: 11831 Thread 3 has reached the rendezvous point in 0.011831 seconds
Seconds: 0 Microseconds: 11994 Thread 4 has reached the rendezvous point in 0.011994 seconds
Seconds: 0 Microseconds: 12151 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 12179 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 12174 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 12220 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 131568 Thread 1 has finished the second part in 0.119394 seconds.
Seconds: 0 Microseconds: 139018 Thread 3 has finished the second part in 0.126839 seconds.
Seconds: 0 Microseconds: 141970 Thread 2 has finished the second part in 0.129750 seconds.
Seconds: 0 Microseconds: 143265 Thread 4 has finished the second part in 0.131114 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.133003 seconds
Seconds: 1 Microseconds: -520309 The process has written the output file. The total time spent is 0.479691 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 6
Two matrices of size 32x32 have been read. The number of threads is 6
Seconds: 0 Microseconds: 12946 Thread 1 has reached the rendezvous point in 0.012946 seconds
Seconds: 0 Microseconds: 13075 Thread 2 has reached the rendezvous point in 0.013075 seconds
Seconds: 0 Microseconds: 13306 Thread 3 has reached the rendezvous point in 0.013306 seconds
Seconds: 0 Microseconds: 13384 Thread 4 has reached the rendezvous point in 0.013384 seconds
Seconds: 0 Microseconds: 13548 Thread 5 has reached the rendezvous point in 0.013548 seconds
Seconds: 0 Microseconds: 13593 Thread 6 has reached the rendezvous point in 0.013593 seconds
Seconds: 0 Microseconds: 13709 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 13715 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 13747 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 13818 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 13719 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 13732 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 93526  Thread 3 has finished the second part in 0.079807 seconds.
Seconds: 0 Microseconds: 94669  Thread 4 has finished the second part in 0.080937 seconds.
Seconds: 0 Microseconds: 99892  Thread 6 has finished the second part in 0.086183 seconds.
Seconds: 0 Microseconds: 124997 Thread 1 has finished the second part in 0.111179 seconds.
Seconds: 0 Microseconds: 129474 Thread 2 has finished the second part in 0.115759 seconds.
Seconds: 0 Microseconds: 138112 Thread 5 has finished the second part in 0.124365 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.126539 seconds
Seconds: 0 Microseconds: 456862 The process has written the output file. The total time spent is 0.456862 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 8
Two matrices of size 32x32 have been read. The number of threads is 8
Seconds: 0 Microseconds: 12002 Thread 1 has reached the rendezvous point in 0.012002 seconds
Seconds: 0 Microseconds: 12141 Thread 2 has reached the rendezvous point in 0.012141 seconds
Seconds: 0 Microseconds: 12431 Thread 3 has reached the rendezvous point in 0.012431 seconds
Seconds: 0 Microseconds: 12580 Thread 4 has reached the rendezvous point in 0.012580 seconds
Seconds: 0 Microseconds: 12712 Thread 5 has reached the rendezvous point in 0.012712 seconds
Seconds: 0 Microseconds: 12830 Thread 6 has reached the rendezvous point in 0.012830 seconds
Seconds: 0 Microseconds: 13068 Thread 8 has reached the rendezvous point in 0.013068 seconds
Seconds: 0 Microseconds: 13113 Thread 7 has reached the rendezvous point in 0.013113 seconds
Seconds: 0 Microseconds: 13295 Thread 7 is advancing to the second part
Seconds: 0 Microseconds: 13308 Thread 8 is advancing to the second part
Seconds: 0 Microseconds: 13326 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 13320 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 13391 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 13310 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 16089 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 17484 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 78577  Thread 7 has finished the second part in 0.065282 seconds.
Seconds: 0 Microseconds: 82312  Thread 5 has finished the second part in 0.068992 seconds.
Seconds: 0 Microseconds: 90026  Thread 1 has finished the second part in 0.076700 seconds.
Seconds: 0 Microseconds: 92191  Thread 3 has finished the second part in 0.078800 seconds.
Seconds: 0 Microseconds: 112039 Thread 2 has finished the second part in 0.095950 seconds.
Seconds: 0 Microseconds: 115515 Thread 6 has finished the second part in 0.102205 seconds.
Seconds: 0 Microseconds: 116824 Thread 8 has finished the second part in 0.103516 seconds.
Seconds: 0 Microseconds: 124463 Thread 4 has finished the second part in 0.106979 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.113909 seconds
Seconds: 0 Microseconds: 448269 The process has written the output file. The total time spent is 0.448269 seconds.
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mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 10
Two matrices of size 32x32 have been read. The number of threads is 10
Seconds: 0 Microseconds: 13088 Thread 1 has reached the rendezvous point in 0.013088 seconds
Seconds: 0 Microseconds: 13156 Thread 2 has reached the rendezvous point in 0.013156 seconds
Seconds: 0 Microseconds: 13330 Thread 3 has reached the rendezvous point in 0.013330 seconds
Seconds: 0 Microseconds: 13551 Thread 4 has reached the rendezvous point in 0.013551 seconds
Seconds: 0 Microseconds: 13731 Thread 5 has reached the rendezvous point in 0.013731 seconds
Seconds: 0 Microseconds: 13849 Thread 6 has reached the rendezvous point in 0.013849 seconds
Seconds: 0 Microseconds: 14086 Thread 7 has reached the rendezvous point in 0.014086 seconds
Seconds: 0 Microseconds: 14137 Thread 8 has reached the rendezvous point in 0.014137 seconds
Seconds: 0 Microseconds: 14295 Thread 9 has reached the rendezvous point in 0.014295 seconds
Seconds: 0 Microseconds: 14363 Thread 10 has reached the rendezvous point in 0.014363 seconds
Seconds: 0 Microseconds: 14574 Thread 10 is advancing to the second part
Seconds: 0 Microseconds: 14622 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 14663 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 14714 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 14796 Thread 7 is advancing to the second part
Seconds: 0 Microseconds: 14842 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 14880 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 18975 Thread 8 is advancing to the second part
Seconds: 0 Microseconds: 19015 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 42078 Thread 9 is advancing to the second part
Seconds: 1 Microseconds: -939772        Thread 5 has finished the second part in 0.045386 seconds.
Seconds: 1 Microseconds: -903899        Thread 3 has finished the second part in 0.081438 seconds.
Seconds: 1 Microseconds: -898424        Thread 6 has finished the second part in 0.082561 seconds.
Seconds: 1 Microseconds: -889527        Thread 7 has finished the second part in 0.095677 seconds.
Seconds: 1 Microseconds: -887931        Thread 9 has finished the second part in 0.069991 seconds.
Seconds: 1 Microseconds: -886501        Thread 4 has finished the second part in 0.098785 seconds.
Seconds: 1 Microseconds: -892011        Thread 2 has finished the second part in 0.093109 seconds.
Seconds: 1 Microseconds: -882029        Thread 10 has finished the second part in 0.103397 seconds.
Seconds: 1 Microseconds: -878203        Thread 1 has finished the second part in 0.107175 seconds.
Seconds: 1 Microseconds: -875320        Thread 8 has finished the second part in 0.105705 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.112876 seconds
Seconds: 1 Microseconds: -534258 The process has written the output file. The total time spent is 0.465742 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 5 -m 12
Two matrices of size 32x32 have been read. The number of threads is 12
Seconds: 0 Microseconds: 12289 Thread 1 has reached the rendezvous point in 0.012289 seconds
Seconds: 0 Microseconds: 12432 Thread 2 has reached the rendezvous point in 0.012432 seconds
Seconds: 0 Microseconds: 12674 Thread 3 has reached the rendezvous point in 0.012674 seconds
Seconds: 0 Microseconds: 12781 Thread 4 has reached the rendezvous point in 0.012781 seconds
Seconds: 0 Microseconds: 12894 Thread 5 has reached the rendezvous point in 0.012894 seconds
Seconds: 0 Microseconds: 13033 Thread 6 has reached the rendezvous point in 0.013033 seconds
Seconds: 0 Microseconds: 13163 Thread 7 has reached the rendezvous point in 0.013163 seconds
Seconds: 0 Microseconds: 13287 Thread 8 has reached the rendezvous point in 0.013287 seconds
Seconds: 0 Microseconds: 13375 Thread 9 has reached the rendezvous point in 0.013375 seconds
Seconds: 0 Microseconds: 13497 Thread 10 has reached the rendezvous point in 0.013497 seconds
Seconds: 0 Microseconds: 13679 Thread 11 has reached the rendezvous point in 0.013679 seconds
Seconds: 0 Microseconds: 13825 Thread 12 has reached the rendezvous point in 0.013825 seconds
Seconds: 0 Microseconds: 14173 Thread 12 is advancing to the second part
Seconds: 0 Microseconds: 14228 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 14309 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 15829 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 15866 Thread 7 is advancing to the second part
Seconds: 0 Microseconds: 15979 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 18492 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 19911 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 28903 Thread 10 is advancing to the second part
Seconds: 0 Microseconds: 31449 Thread 8 is advancing to the second part
Seconds: 0 Microseconds: 34489 Thread 11 is advancing to the second part
Seconds: 0 Microseconds: 31456 Thread 9 is advancing to the second part
Seconds: 0 Microseconds: 69500  Thread 1 has finished the second part in 0.055272 seconds.
Seconds: 0 Microseconds: 88848  Thread 10 has finished the second part in 0.059945 seconds.
Seconds: 0 Microseconds: 93123  Thread 2 has finished the second part in 0.074631 seconds.
Seconds: 1 Microseconds: -904086        Thread 12 has finished the second part in 0.081741 seconds.
Seconds: 1 Microseconds: -901461        Thread 8 has finished the second part in 0.067090 seconds.
Seconds: 1 Microseconds: -901332        Thread 6 has finished the second part in 0.082689 seconds.
Seconds: 1 Microseconds: -898903        Thread 3 has finished the second part in 0.085268 seconds.
Seconds: 1 Microseconds: -898604        Thread 9 has finished the second part in 0.069940 seconds.
Seconds: 1 Microseconds: -891523        Thread 7 has finished the second part in 0.092611 seconds.
Seconds: 1 Microseconds: -884678        Thread 11 has finished the second part in 0.080833 seconds.
Seconds: 1 Microseconds: -878811        Thread 5 has finished the second part in 0.106880 seconds.
Seconds: 1 Microseconds: -865743        Thread 4 has finished the second part in 0.114346 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.123322 seconds
Seconds: 1 Microseconds: -542629 The process has written the output file. The total time spent is 0.457371 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$
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N	Number of threads	Total Calculation Time (s)
5	2	0.250285
5	4	0.133003
5	6	0.126539
5	8	0.113909
5	10	0.112876
5	12	0.123322

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mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 4 -m 2
Two matrices of size 16x16 have been read. The number of threads is 2
Seconds: 0 Microseconds: 4463 Thread 1 has reached the rendezvous point in 0.004463 seconds
Seconds: 0 Microseconds: 4648 Thread 2 has reached the rendezvous point in 0.004648 seconds
Seconds: 0 Microseconds: 4755 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 4839 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 15610  Thread 2 has finished the second part in 0.010855 seconds.
Seconds: 0 Microseconds: 15944  Thread 1 has finished the second part in 0.011105 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.012226 seconds
Seconds: 0 Microseconds: 80249 The process has written the output file. The total time spent is 0.080249 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 4 -m 4
Two matrices of size 16x16 have been read. The number of threads is 4
Seconds: 0 Microseconds: 4384 Thread 1 has reached the rendezvous point in 0.004384 seconds
Seconds: 0 Microseconds: 4435 Thread 2 has reached the rendezvous point in 0.004435 seconds
Seconds: 0 Microseconds: 4547 Thread 3 has reached the rendezvous point in 0.004547 seconds
Seconds: 0 Microseconds: 4670 Thread 4 has reached the rendezvous point in 0.004670 seconds
Seconds: 0 Microseconds: 4750 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 4768 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 4826 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 4830 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 10170  Thread 4 has finished the second part in 0.005420 seconds.
Seconds: 0 Microseconds: 12190  Thread 2 has finished the second part in 0.007422 seconds.
Seconds: 0 Microseconds: 12336  Thread 1 has finished the second part in 0.007510 seconds.
Seconds: 0 Microseconds: 12543  Thread 3 has finished the second part in 0.007713 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.008852 seconds
Seconds: 0 Microseconds: 80541 The process has written the output file. The total time spent is 0.080541 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 4 -m 6
Two matrices of size 16x16 have been read. The number of threads is 6
Seconds: 0 Microseconds: 3649 Thread 1 has reached the rendezvous point in 0.003649 seconds
Seconds: 0 Microseconds: 3698 Thread 2 has reached the rendezvous point in 0.003698 seconds
Seconds: 0 Microseconds: 3864 Thread 3 has reached the rendezvous point in 0.003864 seconds
Seconds: 0 Microseconds: 4046 Thread 4 has reached the rendezvous point in 0.004046 seconds
Seconds: 0 Microseconds: 4163 Thread 5 has reached the rendezvous point in 0.004163 seconds
Seconds: 0 Microseconds: 4330 Thread 6 has reached the rendezvous point in 0.004330 seconds
Seconds: 0 Microseconds: 4512 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 4548 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 4545 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 4545 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 4599 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 4612 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 8500   Thread 6 has finished the second part in 0.003988 seconds.
Seconds: 0 Microseconds: 8791   Thread 5 has finished the second part in 0.004192 seconds.
Seconds: 0 Microseconds: 9936   Thread 2 has finished the second part in 0.005388 seconds.
Seconds: 0 Microseconds: 9943   Thread 3 has finished the second part in 0.005331 seconds.
Seconds: 0 Microseconds: 10090  Thread 1 has finished the second part in 0.005545 seconds.
Seconds: 0 Microseconds: 10493  Thread 4 has finished the second part in 0.005948 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.007585 seconds
Seconds: 0 Microseconds: 70861 The process has written the output file. The total time spent is 0.070861 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$ ./hw5 -i input1.txt -j input2.txt -o output2.txt -n 4 -m 8
Two matrices of size 16x16 have been read. The number of threads is 8
Seconds: 0 Microseconds: 4340 Thread 1 has reached the rendezvous point in 0.004340 seconds
Seconds: 0 Microseconds: 4514 Thread 2 has reached the rendezvous point in 0.004514 seconds
Seconds: 0 Microseconds: 4602 Thread 3 has reached the rendezvous point in 0.004602 seconds
Seconds: 0 Microseconds: 4839 Thread 4 has reached the rendezvous point in 0.004839 seconds
Seconds: 0 Microseconds: 4975 Thread 5 has reached the rendezvous point in 0.004975 seconds
Seconds: 0 Microseconds: 5001 Thread 6 has reached the rendezvous point in 0.005001 seconds
Seconds: 0 Microseconds: 5206 Thread 7 has reached the rendezvous point in 0.005206 seconds
Seconds: 0 Microseconds: 5323 Thread 8 has reached the rendezvous point in 0.005323 seconds
Seconds: 0 Microseconds: 5521 Thread 8 is advancing to the second part
Seconds: 0 Microseconds: 5559 Thread 1 is advancing to the second part
Seconds: 0 Microseconds: 5554 Thread 4 is advancing to the second part
Seconds: 0 Microseconds: 5557 Thread 6 is advancing to the second part
Seconds: 0 Microseconds: 5597 Thread 3 is advancing to the second part
Seconds: 0 Microseconds: 5613 Thread 2 is advancing to the second part
Seconds: 0 Microseconds: 5576 Thread 7 is advancing to the second part
Seconds: 0 Microseconds: 9259   Thread 1 has finished the second part in 0.003700 seconds.
Seconds: 0 Microseconds: 9454   Thread 3 has finished the second part in 0.003857 seconds.
Seconds: 0 Microseconds: 9509   Thread 6 has finished the second part in 0.003952 seconds.
Seconds: 0 Microseconds: 9519   Thread 2 has finished the second part in 0.003906 seconds.
Seconds: 0 Microseconds: 9550   Thread 8 has finished the second part in 0.004029 seconds.
Seconds: 0 Microseconds: 9595   Thread 4 has finished the second part in 0.004041 seconds.
Seconds: 0 Microseconds: 9798 Thread 5 is advancing to the second part
Seconds: 0 Microseconds: 9852   Thread 7 has finished the second part in 0.004276 seconds.
Seconds: 0 Microseconds: 12518  Thread 5 has finished the second part in 0.002720 seconds.
Total time spent, from the moment the files were read into memory, until the calculations were completed:0.008916 seconds
Seconds: 0 Microseconds: 79208 The process has written the output file. The total time spent is 0.079208 seconds.
mustafa@mustafa-Aspire-A515-52G:/media/mustafa/Yerel Disk 2/3_Sınıf_2_Donem/System Programming/hw5$
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N	Number of threads	Total Calculation Time (s)
4	2	0.012226
4	4	0.008852
4	6	0.007585
4	8	0.008916