

Assignment 8 - Strassen's matrix multiplication

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Problem Statement

1. (15 points) Write a function which, on an input of two $n \times n$ matrices, outputs their product using Strassen's method. Call this function for **random** 0 – 1 matrices¹ of size $n = 2^k$, $k \in [1, N]$.

Keep a record of the running time of each call. Compare it with $n^{\log 7}$. I.e. output the running time for n , $n^{\log 7}$, and the ratio of both these values for n .

Here is the output obtained which contains for each n , the time taken for the matrix multiplication function, $n^{\log 7}$, and their ratio :

```
prakhar@prakhar-XPS-13-7390:~/Downloads$ c++ strassen_1906328_1904119_1904129.cpp
prakhar@prakhar-XPS-13-7390:~/Downloads$ ./a.out
n = 2,    execution time(sec) = 0.000001,    n^log(7) = 7.000000,    ratio = 0.00000014
n = 4,    execution time(sec) = 0.000137,    n^log(7) = 49.000000,    ratio = 0.00000280
n = 8,    execution time(sec) = 0.001010,    n^log(7) = 343.000000,    ratio = 0.00000294
n = 16,    execution time(sec) = 0.006648,    n^log(7) = 2401.000000,    ratio = 0.00000277
n = 32,    execution time(sec) = 0.047516,    n^log(7) = 16807.000000,    ratio = 0.00000283
n = 64,    execution time(sec) = 0.162686,    n^log(7) = 117649.000000,    ratio = 0.00000138
n = 128,   execution time(sec) = 0.820467,    n^log(7) = 823543.000000,    ratio = 0.00000100
n = 256,   execution time(sec) = 5.314776,    n^log(7) = 5764801.000000,    ratio = 0.00000092
```