# Strassen’s matrix multiplication Algorithm:

**Definition:** Strassen algorithm is a recursive algorithm for matrix multiplication where we divide the matrix into 4 sub-matrices of dimensions n/2 x n/2 in each recursive step.

Diagram

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1. Initially, the code will take the size of matrix A and matrix B as input.



1. Now, I have created two multidimensional arrays, to take matrix A and matrix B as input. The numbers in the matrix are entered one after the other. Once the input is taken, print the matrix A and matrix B values.

Graphical user interface, text

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1. Now, I have passed matrix A and matrix B as parameters to the “strassen” function.

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1. The function “strassen” is a recursive function that divides matrix A and matrix B into sub-matrices and computes as per Strassen’s sum and product formulas to produce a result matrix C.

**Strassen’s Algorithm:**

1. Firstly, the function takes matrix A and matrix B as input.
2. We check if the size of matrix A or matrix B is one, if it is a 1x1 matrix, we do not have to divide it further. Hence, we return a simple multiplied value of matrix A and matrix B.
3. Now, we check if the size of the matrix is even or odd. If it is odd, we add another column to the matrices A and B for easy division of the matrix to for sub-matrices. If the size is even, we do not modify the matrices.
4. Now, we divide the matrix into sub-matrices of equal size. Say, if it is a 4x4 matrix, we divide it into 4 sub-matrices. A11 will take the values of the first quadrant of matrix A, A12 will take the second quadrant values of matrix A, A21 will take the third quadrant values of matrix A and A22 will take the fourth quadrant values of matrix A. Similarly, B11, B12, B21, and B22 will take the values of matrix B values of the first, second, third, and fourth quadrants, respectively.

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1. Once the matrices are partitioned into sub-matrices, we now calculate the sum values as per Strassen’s algorithm.

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1. Now, we compute the product values by recursively calling the defined function by passing the sub-matrices and above-computed sum values of matrices as shown below.

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1. The Strassen function is called recursively until the size of the sub-divided matrix is 1.
2. Once, the product values are all computed. The resulting matrix is calculated using the following formula.

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1. Now the combined matrix C is the final result of the matrix multiplication of matrix A and matrix B.

**Code for Strassen’s matrix multiplication:**

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Graphical user interface, text, application, email

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**Execution/ Output:**

1. **For 4x4 matrix**

Table

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1. **For 3x3 matrix:**

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