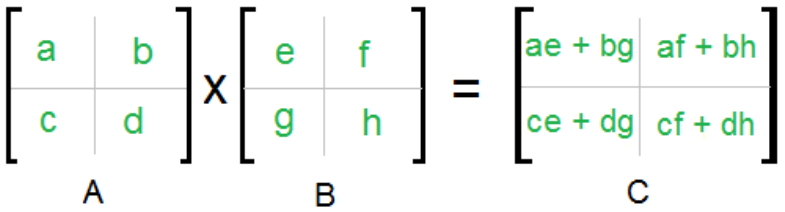
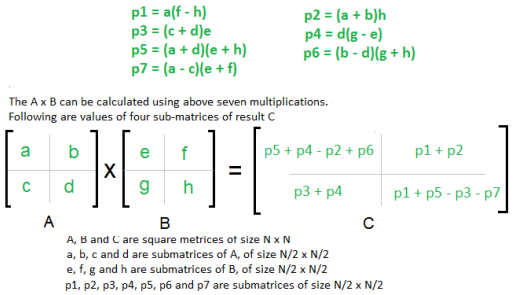
Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous College Affiliated to University of Mumbai)

PRACTICAL NO. 3	DESIGN AND ANALYSIS OF ALGORITHMS
NAME	VEDANTI ANIL WADATKAR
UID	2021700072
BATCH	D4
PROBLEM STATEMENT	Let us consider two matrices X and Y. We want to calculate the resultant matrix Z by multiplying X and Y.
EXPLANATION	Following is simple Divide and Conquer method to multiply two square matrices. ● Divide matrices A and B in 4 sub-matrices of size N/2 x N/2 as shown in the below diagram. ● Calculate following values recursively. ae + bg, af + bh, ce + dg and cf + dh.
	 A, B and C are square metrices of size N x N a, b, c and d are submatrices of A, of size N/2 x N/2 e, f, g and h are submatrices of B, of size N/2 x N/2
TIME COMPLEXITY	Here, we assume that integer operations take O(1) time. There are three for loops in this algorithm and one is nested in other. Hence, the algorithm takes O(n3) time to execute.

ALGORITHM FOR NAIVE METHOD	Algorithm: Matrix-Multiplication (X, Y, Z)
	for i = 1 to p do
	  for j = 1 to r do
	  Z[i,j] := 0
	  for k = 1 to q do
	  Z[i,j] := Z[i,j] + X[i,k] × Y[k,j]

STRASSEN'S MATRIX MULTIPLICATION METHOD	 T(N) = 7T(N/2) + O(N2) From Master's Theorem, time complexity of above method is O(NLog7) which is approximately O(N2.8074)