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Experiment No.	3

AIM:	Implement Divide and Conquer technique.
Program	
PROBLEM STATEMENT :	Implement Strassen's Matrix Multiplication algorithm and compare it with standard matrix multiplication.

ALGORITHM/ THEORY:	// C code of two 2 by 2 matrix multiplication using Strassen's algorithm
	
	#include<stdio.h>
	int main(){
	int a[2][2], b[2][2], c[2][2], i, j;
	int m1, m2, m3, m4 , m5, m6, m7;
	
	printf("Enter the 4 elements of first matrix: ");
	for(i = 0;i < 2; i++)
	for(j = 0;j < 2; j++)
	scanf("%d", &a[i][j]);
	
	printf("Enter the 4 elements of second matrix: ");
	for(i = 0; i < 2; i++)
	for(j = 0;j < 2; j++)
	scanf("%d", &b[i][j]);

```
printf("\nThe first matrix is\n");
for(i = 0; i < 2; i++){
   printf("\n");
   for(j = 0; j < 2; j++)
       printf("%d\t", a[i][j]);
}

printf("\nThe second matrix is\n");
for(i = 0;i < 2; i++){
   printf("\n");
   for(j = 0;j < 2; j++)
       printf("%d\t", b[i][j]);
}

m1= (a[0][0] + a[1][1]) * (b[0][0] + b[1][1]);
m2= (a[1][0] + a[1][1]) * b[0][0];
m3= a[0][0] * (b[0][1] - b[1][1]);
m4= a[1][1] * (b[1][0] - b[0][0]);
m5= (a[0][0] + a[0][1]) * b[1][1];
m6= (a[1][0] - a[0][0]) * (b[0][0]+b[0][1]);
m7= (a[0][1] - a[1][1]) * (b[1][0]+b[1][1]);

c[0][0] = m1 + m4- m5 + m7;
c[0][1] = m3 + m5;
c[1][0] = m2 + m4;
```

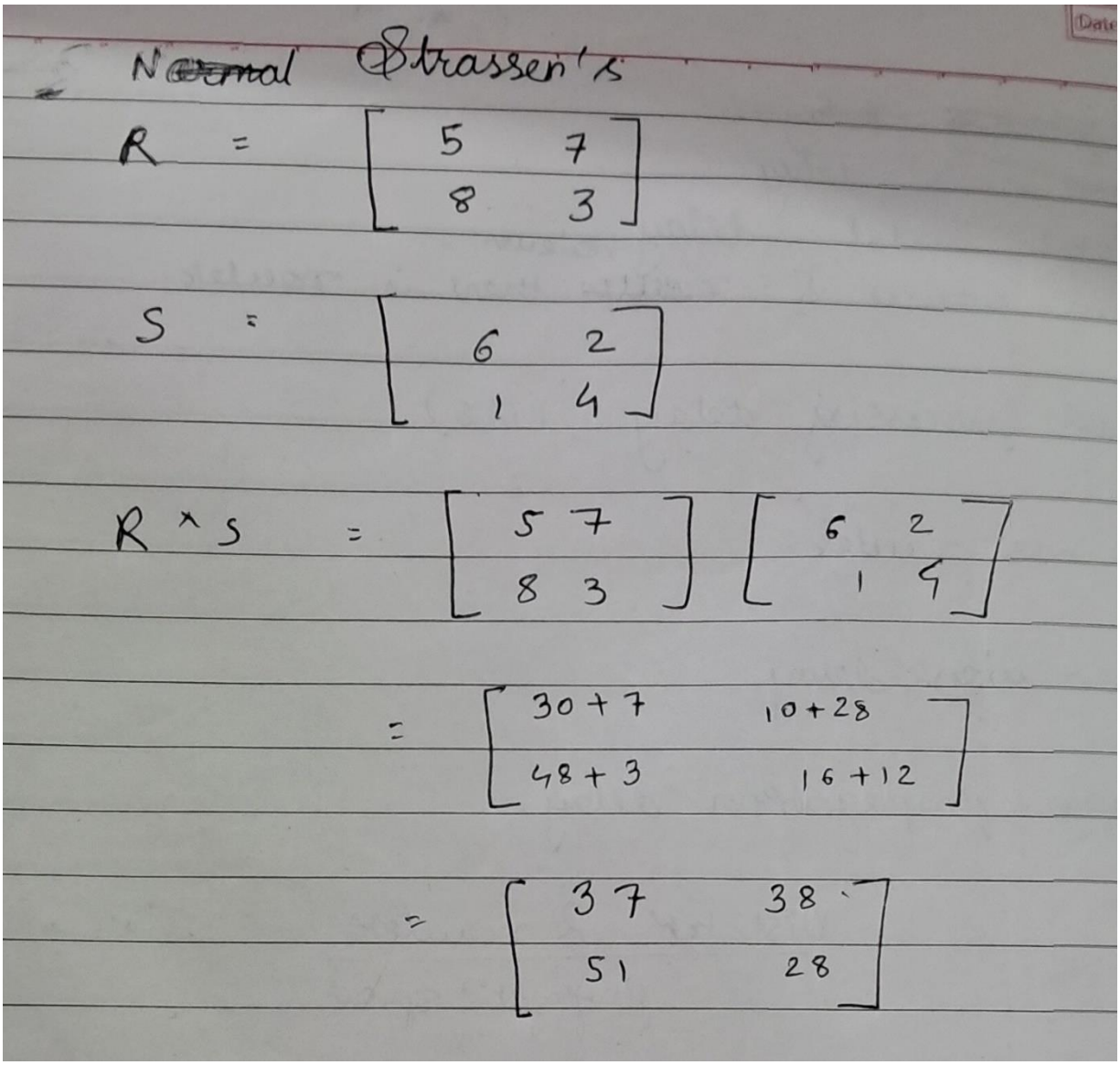
```
  c[1][1] = m1 - m2 + m3 + m6;


  printf("\nAfter multiplication using Strassen's algorithm \n");
  for(i = 0; i < 2 ; i++){
    printf("\n");
    for(j = 0;j < 2; j++)
        printf("%d\t", c[i][j]);
  }


  return 0;
}
```

Result:

OUTPUT 1:

```
Enter the 4 elements of first matrix: 5 7 8 3
Enter the 4 elements of second matrix: 6 2 1 4

The first matrix is

5       7
8       3
The second matrix is

6       2
1       4
After multiplication using Strassen's algorithm

37      38
51      28

...Program finished with exit code 0
Press ENTER to exit console.
```

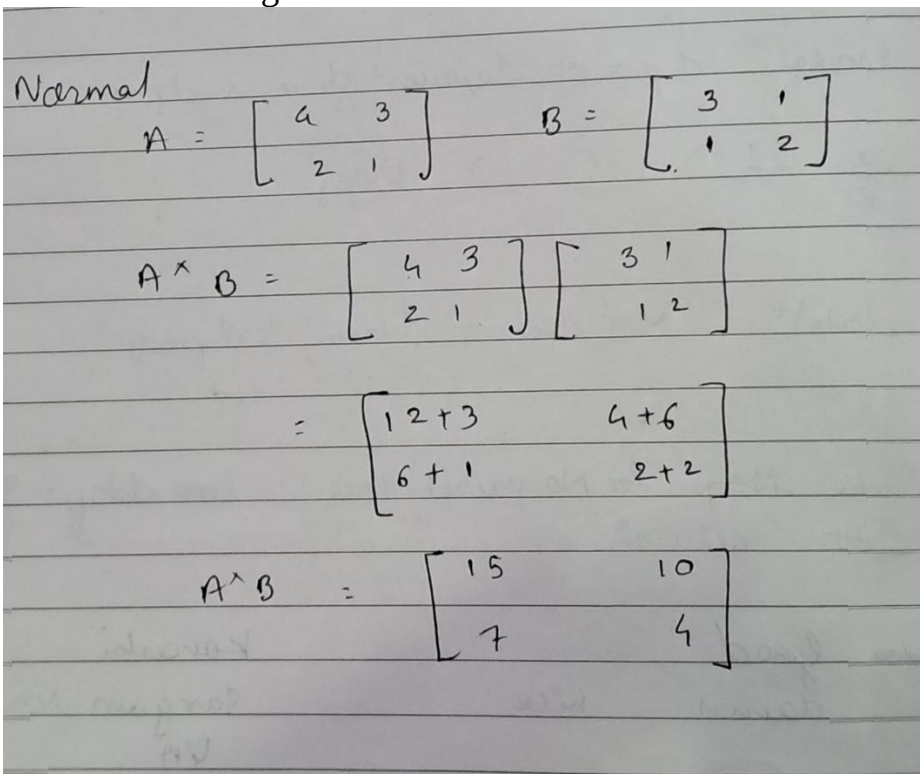
Verification of algorithm:


Normal Strassen's
R = [5 7 ; 8 3]
S = [6 2 ; 1 4]
R * S = [5 7 ; 8 3] [6 2 ; 1 4]
= [30+7 10+28 ; 48+3 16+12]
= [37 38 ; 51 28]

OUTPUT2:

```
Enter the 4 elements of first matrix: 4 3 2 1
Enter the 4 elements of second matrix: 3 1 1 2

The first matrix is

4       3
2       1
The second matrix is

3       1
1       2
After multiplication using Strassen's algorithm

15      10
7       4

...Program finished with exit code 0
Press ENTER to exit console.
```

Verification of algorithm:



CONCLUSION:	We used Strassen's Matrix Multiplication and compared with Standard Matrix Multiplication logic. On comparison we found out that Strassen's is better than standard method for multiplication of square matrices.