

**CHANDIGARH UNIVERSITY
UNIVERSITY INSTITUTE OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**



Submitted By: Vivek Kumar(21BCS8129)		Submitted To: Neha Dutta(E12830)	
Subject Name	Design and Analysis of Algorithm Lab		
Subject Code	20CSP-312		
Branch	Computer Science and Engineering		
Semester	5 th		

Experiment - 5

Student Name: Vivek Kumar

Branch: BE-CSE(LEET)

Semester: 5th

Subject Name: DAA Lab

UID: 21BCS8129

Section/Group: 20BCS-WM-616/A

Date of Performance: 10/10/2022

Subject Code: 20CSP-312

1. Aim/Overview of the practical:

Code and analyze to find an optimal solution to matrix chain multiplication using dynamic programming.

2. Task to be done/ Which logistics used:

Write a program to find the optimal solution of the Matrix Chain Multiplication.

3. Requirements (For programming-based labs):

- Laptop or PC.
- Operation system (Mac, Windows, Linux, or any)
- Vs-Code with MinGw or any C++ Compiler

4. Algorithm/Flowchart (For programming-based labs)

1. First, it will divide the matrix sequence into two subsequences.
2. You will find the minimum cost of multiplying out each subsequence.
3. You will add these costs together and in the price of multiplying the two result matrices.
4. These procedures will be repeated for every possible matrix split and calculate the minimum.

5. Steps for experiment/practical/Code:

```
#include <bits/stdc++.h>
using namespace std;
#define MAX 10
int look_up[MAX][MAX];

int MatrixChainMultiplication(int dims[], int i, int j)
{
    if (j <= i + 1)
        return 0;

    int min = INT_MAX;

    if (look_up[i][j] == 0) {

        for (int k = i + 1; k <= j - 1; k++){
            int cost = MatrixChainMultiplication(dims, i, k);
            cost += MatrixChainMultiplication(dims, k, j);
            cost += dims[i] * dims[k] * dims[j];
        }
    }
}
```

```
        if (cost < min)
            min = cost;
    }
    look_up[i][j] = min;
}

return look_up[i][j];
}

int main() {
    // input is `10 x 30` matrix, `30 x 5` matrix, `5 x 60` matrix
    int n, i;
    cout << "Enter the number of Matrices\n";
    cin >> n;

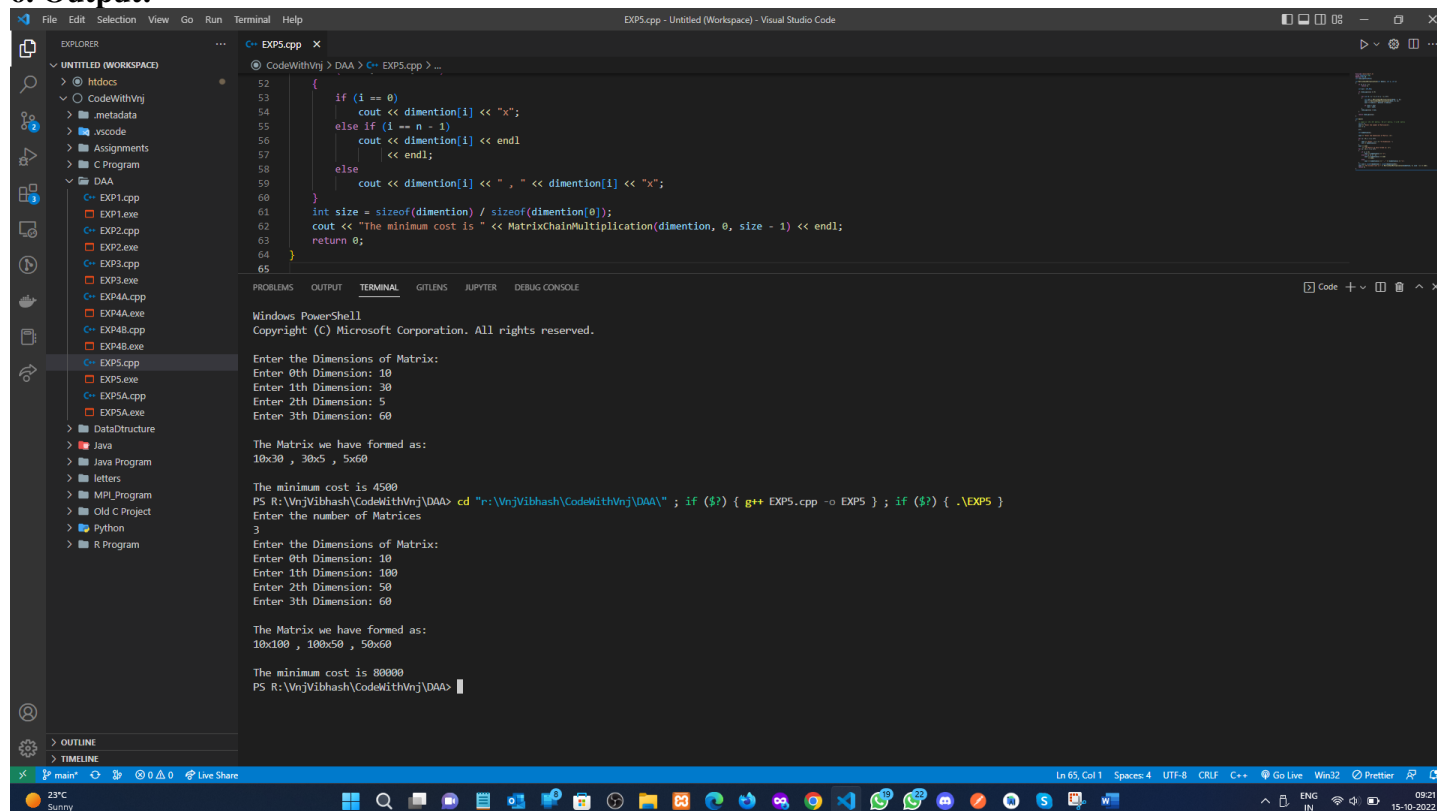
    n++;

    int dimension[n];

    cout << "Enter the Dimensions of Matrix: \n";

    for (i = 0; i < n; i++)
    {
        cout << "Enter " << i << "th Dimension: ";
        cin >> dimension[i];
    }
    cout << endl << "The Matrix we have formed as: \n";
    for (i = 0; i < n; i++)
    {
        if(i==0)
            cout << dimension[i] << "x";
        else if(i==n-1)
            cout << dimension[i] << endl << endl;
        else
            cout << dimension[i] << " , " << dimension[i] << "x";
    }
    int size = sizeof(dimension) / sizeof(dimension[0]);
    cout << "The minimum cost is " << MatrixChainMultiplication(dimension, 0, size - 1) <<
endl;
    return 0;
}
```

6. Output:



```

52  {
53      if (i == 0)
54          cout << dimension[i] << "x";
55      else if (i == n - 1)
56          cout << dimension[i] << endl;
57          << endl;
58      else
59          cout << dimension[i] << " , " << dimension[i+1] << "x";
60      }
61      int size = sizeof(dimension) / sizeof(dimension[0]);
62      cout << "The minimum cost is " << MatrixChainMultiplication(dimension, 0, size - 1) << endl;
63      return 0;
64  }
65  }

```

Windows PowerShell
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Enter the Dimensions of Matrix:
Enter 0th Dimension: 10
Enter 1th Dimension: 30
Enter 2th Dimension: 5
Enter 3th Dimension: 60

The Matrix we have formed as:
10x30 , 30x5 , 5x60

The minimum cost is 4500
PS R:\VnjVibhash\CodeWithWnj\DAA> cd "R:\VnjVibhash\CodeWithWnj\DAA\" ; if (\$?) { g++ EXPS.cpp -o EXPS ; if (\$?) { .\EXPS }
Enter the number of Matrices
3
Enter the Dimensions of Matrix:
Enter 0th Dimension: 10
Enter 1th Dimension: 100
Enter 2th Dimension: 50
Enter 3th Dimension: 60

The Matrix we have formed as:
10x100 , 100x50 , 50x60

The minimum cost is 80000
PS R:\VnjVibhash\CodeWithWnj\DAA> |

Learning outcomes (What I have learnt):

1. How to solve the Matrix Chain Multiplication problem using dynamic programming.
2. How to use the Array elements as a Matrix rows and columns.

Evaluation Grid (To be created per the faculty's SOP and Assessment guidelines):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.	Worksheet completion including writing learning objectives/Outcomes. (To be submitted at the end of the day).		
2.	Post-Lab Quiz Result.		
3.	Student Engagement in Simulation/Demonstration/Performance and Controls/Pre-Lab Questions.		
	Signature of Faculty (with Date):	Total Marks Obtained:	



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