 Marwadi University	Marwadi University Faculty of Technology Department of Information and Communication Technology	
Subject: DAA (01CT0512)	AIM: Matrix Chain Multiplication using Dynamic Programming:	
Experiment No: 19	Date: 26/9/2023	Enrolment No: 92100133020

Matrix Chain Multiplication using Dynamic Programming:

Dynamic programming solves matrix chain multiplication problem by building a 2D table where **dp[i][j]** stores the minimum number of scalar multiplications needed to compute the matrix product of matrices from **i** to **j**.

Algorithm:

1. Create a 2D array **dp[n][n]** where **n** is the number of matrices.
2. Initialize the array with zeros.
3. Iterate through the matrices, filling up the **dp** table based on optimal subproblem solutions.


Code:

```
#include <iostream>
#include <climits>
using namespace std;

int matrixChainMultiplication(int p[], int n) {
    int dp[n][n];
    for (int i = 1; i < n; i++)
        dp[i][i] = 0;

    for (int chainLen = 2; chainLen < n; chainLen++) {
        for (int i = 1; i < n - chainLen + 1; i++) {
            int j = i + chainLen - 1;
            dp[i][j] = INT_MAX;
            for (int k = i; k <= j - 1; k++) {
                int cost = dp[i][k] + dp[k + 1][j] + p[i - 1] * p[k] * p[j];
                if (cost < dp[i][j])
                    dp[i][j] = cost;
            }
        }
    }
    return dp[1][n - 1];
}

int main() {
    int p[] = {10, 30, 5, 60};
    int n = sizeof(p) / sizeof(p[0]);
    cout << "Minimum number of multiplications: " << matrixChainMultiplication(p, n);
    return 0;
}
```

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Output:

```
Minimum number of multiplications: 4500
```

Space complexity: _____

Justification: _____

Time complexity:

Best case time complexity: _____

Justification: _____

Worst case time complexity: _____

Justification: _____