DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
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UNIVERSITY INSTITUTE OF ENGINEERING

Department of Computer Science & Engineering

Subject Name: DAA Lab

Subject Code: 20ITP-312

Submitted to:

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Group: A

Worksheet Experiment – 2.1

Name: Aakash singh **UID: 20BCS5620**
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Semester: 5th **Subject: DAA Lab**

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:

Find the minimum multiplication operations required for multiply n matrices.

3. Algorithm/Flowchart:

1. Build a matrix dp[][] of size N*N for memoization purposes.
2. Use the same recursive call as done in the above approach:
3. When we find a range (i, j) for which the value is already calculated, return the minimum value for that range (i.e., dp[i][j]).
4. Otherwise, perform the recursive calls as mentioned earlier.
5. The value stored at dp[0][N-1] is the required answer.

4. Steps for experiment/practical/Code:

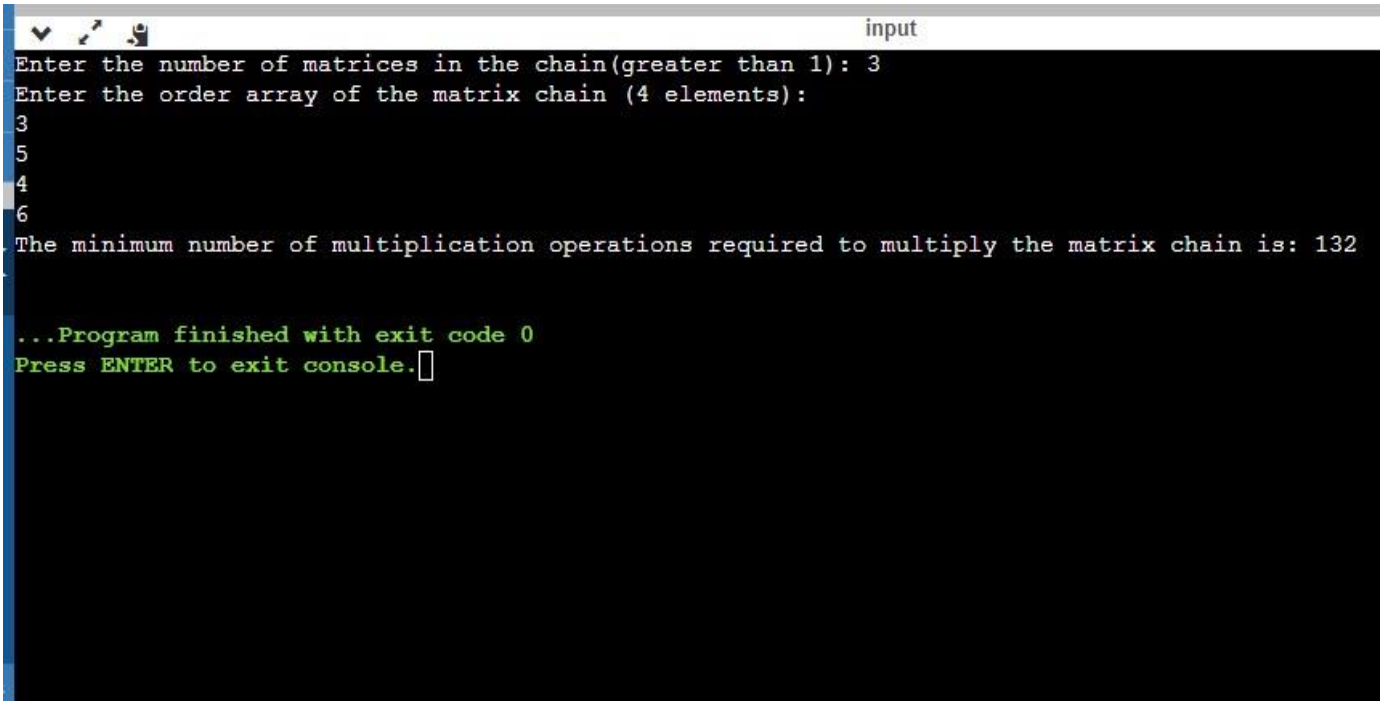
```
#include<iostream>
#include<climits> using
namespace std; int
matrixChain(int n, int order[])
{
   int i,j,k;
   int tempValue;
int dp[n+1][n+1];
for(i=1;i<=n;i++)
   {
dp[i][i]=0;
   }
   for(int size=2;size<=n;size++)
   {
      for(i=1;i<=(n-size+1);i++)
      {          j=i+size-1;
dp[i][j]=INT_MAX;

         for(k=i;k<j;k++)
         {
            tempValue=dp[i][k]+dp[k+1][j]+order[i-1]*order[k]*order[j];
if(tempValue<dp[i][j])
            {
               dp[i][j]=tempValue;
```

```
            }
          }
        }
    }
    return dp[1][n];
} int
main()
{
    int i,j;
int n;
    cout<<"Enter the number of matrices in the chain(greater than 1): ";
cin>>n;     int order[n+1];
    cout<<"Enter the order array of the matrix chain ("<<n+1<<" elements): "<<endl;
for(i=0;i<=n;i++)
    {
        cin>>order[i];
    }
    cout<<"The minimum number of multiplication operations required to multiply the matrix
chain is: "<<matrixChain(n,order);
    cout<<endl;
return 0;
}
```

5. Observations/Discussions/ Complexity Analysis:

Time Complexity: O(n^3)

6. Result/Output/Writing Summary:



Learning Outcomes:-

1. Create a program keeping in mind the time complexity
2. Create a program keeping in mind the space complexity
3. Steps to make optimal algorithm
4. Learnt about matrix application using dynamic programming.