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LAB-8

Q1) You are given a sequence of integers $arr[1], arr[2], \dots, arr[N]$. You are asked to split the sequence into K sub-sequences such that the sum of the maximum element in each subsequence is minimized. For example, if $K=2$, and $arr=[1, 2, 3, 4, 5]$, one possible split would be $[1, 2, 3, 4]$ and $[5]$, which gives a maximum sum of $4+5=9$. Returns the minimum possible sum of maximum elements in each of the K sub-sequences. Your algorithm should run in $O(N^2K)$ time.

```
1  #include <bits/stdc++.h>
2
3  using namespace std;
4
5  int main(){
6      int n;
7      int k;
8      cin >> n >> k;
9      vector<int>v(n);
10     for(int i=0 ; i<n ; i++){
11         cin >> v[i];
12     }
13     int ans=0;
14     sort(v.begin(),v.end());
15     for(int i=0 ; i<k-1 ; i++){
16         ans+=v[i];
17     }
18     int maxm=INT_MIN;
19     for(int i=k-1 ; i<n ; i++){
20         maxm=max(v[i],maxm);
21     }
22     ans+=maxm;
23     cout<<ans<< "\n";
24 }
```

```
PS C:\Users\Gaurav\Programming\practice> g++ assign8_a.cpp -o code
PS C:\Users\Gaurav\Programming\practice> ./code
5 2
1 2 3 4 5
6
PS C:\Users\Gaurav\Programming\practice> _
```

Q2) You are given an $m \times n$ matrix of twos and threes. Return the number of square submatrices which have all twos.

```

C++ assign8_b.cpp > main()
1  #include <bits/stdc++.h>
2  using namespace std;
3  int countSquares(vector<vector<int>>& matrix) {
4      int m = matrix.size();
5      if(m==0) return 0;
6      int n = matrix[0].size();
7      int result = 0;
8      vector<vector<int>> dp(m+1, vector<int>(n+1, 0));
9      int ret = 0;
10     for(int i = 1; i <= m; i++){
11         for(int j = 1; j <= n; j++){
12             if(matrix[i-1][j-1] == 3){
13                 dp[i][j] = 0;
14             }else{
15                 dp[i][j] = 1 + min(dp[i-1][j], min(dp[i][j-1], dp[i-1][j-1]));
16             }
17             result += dp[i][j];
18         }
19     }
20     return result;
21 }
22 int main(){
23     int n,m;
24     cin >> n >> m;
25     vector<vector<int>>matrix(n,vector<int>(m));
26     for(int i=0 ; i<n ; i++){
27         for(int j=0 ; j<m ; j++){
28             cin >> matrix[i][j];
29         }
30     }
31     int ans = countSquares(matrix);
32     cout << ans << "\n";
33 }

```

```

PS C:\Users\Gaurav\Programming\practice> g++ assign8_b.cpp -o code
PS C:\Users\Gaurav\Programming\practice> ./code
3 3
2 3 2
2 2 2
2 2 3
8
PS C:\Users\Gaurav\Programming\practice>

```