ICPC CodeBook

1 Dynamic Programming

1.1 0/1 Knapsack_problems

```cpp
#include<bits/stdc++.h>
using namespace std;
int f[1000]={0};
int n=0, m=0;
int main(){
    cin >> n >> m;
    for (int i = 1;i <= n;i++){
        int price = 0, value = 0;
        cin >> price >> value;
        for (int j = m;j >= price;j--){
            if (f[j-price]+value>f[j]){
                f[j]=f[j-price]+value;
            }
        }
    }
    cout << f[m] << endl;
    return 0;
}
```

1.2 Complete_Knapsack_problems

```cpp
#include<bits/stdc++.h>
using namespace std;
int f[1000]={0};
int n=0, m=0;
int main(){
    cin >> n >> m;
    for (int i=1;i<=n;i++){
        int price=0, value=0;
        cin >> price >> value;
        for (int j=price; j<=m; j++){
            if (f[j-price]+value>f[j]){
                f[j]=f[j-price]+value;
            }
        }
    }
    cout << f[m] << endl;
    return 0;
}
```

1.3 LCS

```cpp
#include<bits/stdc++.h>
using namespace std;

int dp[1001][1001];
int lcs(const string &s, const string &t){
    int m = s.size(), n = t.size();
    if (m == 0 || n == 0){
        return 0;
    }
    for(int i = 0; i <= m; ++i){
        dp[i][0] = 0;
    }
    for(int j = 1; j <= n; ++j){
        dp[0][j] = 0;
    }
    for(int i = 0; i < m; ++i){
        for (int j = 0; j < n; ++j){
            if(s[i] == t[j]){
                dp[i+1][j+1] = dp[i][j]+1;
            }else{
                dp[i+1][j+1] = max(dp[i+1][j],
                    dp[i][j+1]);
            }
        }
    }
    return dp[m][n];
}
```

1.4 LICS

```cpp
#include<bits/stdc++.h>
using namespace std;
int a[100] = {0};
int b[100] = {0};
int f[100] = {0};
int n = 0,m = 0;
int main(){
    cin >> n;
    for(int i = 1;i <= n;i++){
        cin >> a[i];
    }
    cin >> m;
    for(int i = 1;i <= m;i++){
        cin >> b[i];
    }
    for(int i = 1;i <= n;i++){
        int k = 0;
        for (int j = 1;j <= m;j++){
            if(a[i] > b[j] && f[j] > k){
                k = f[j];
            }else if(a[i] == b[j] && k + 1 > f[j]){
                f[j] = k + 1;
            }
        }
    }
    int ans=0;
    for(int i = 1;i <= m;i++){
        if(f[i] > ans){
            ans = f[i];
        }
    }
    cout << ans << endl;
    return 0;
}
```

1.5 LIS

```cpp
#include<bits/stdc++.h>
using namespace std;
int n=0;
int a[100]={0}, f[100]={0}, x[100]={0};
int main(){
    cin >> n;
    for(int i = 1;i <= n;i++){
        cin >> a[i];
        x[i] = INT_MAX;
    }
    f[0]=0;
    int ans=0;
    for(int i = 1;i <= n;i++){
        int l = 0,r = i;
        while (l+1<r){
            int m=(l+r)/2;
            if (x[m]<a[i]){
                l=m;
            }else{
                r=m;
            }
            // change to x[m]<=a[i] for
                non-decreasing case
        }
        f[i]=l+1;
        x[l+1]=a[i];
        if(f[i]>ans){
            ans=f[i];
```

```
28          }
29      }
30      cout << ans << endl;
31      return 0;
32  }
```