Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	100	25	525

Task A ()

```cpp
#include <iostream>

using namespace std;

int f(long long s, int g)
{
    if(s == 0 || g > 100)
        return 0;
    return s + f(s-1,g+1)/10;
}

int main()
{
    long long k;
    cin >> k;
    cout << f(k,0)%10;
    return 0;
}
```

Task B ()

```cpp
#include <bits/stdc++.h>
#define x first
#define y second
#define deb if(debug)

using namespace std;

typedef long long ll;
typedef long double ld;
const bool debug = 0;


int main()
{
    if(!debug)
    {
        cin.tie(0);
        cout.tie(0);
        ios::sync_with_stdio(0);
    }
    int n,k;
    cin >> n >> k;
    string s;
    cin >> s;
    vector<int> c(26,0);
    int g = 0;
    int j = n;
    vector<int> a(n);
    for(int i=n-1;i>=0;i--)
    {
        while(j > 0)
        {
            if(c[s[j-1]-'a'] == 0)
            {
                g++;
            }
            if(g > 3)
            {
                g--;
                break;
            }
            c[s[j-1] - 'a'] ++;
            j--;
        }
        a[i] = max(j,i-k+1);
        c[s[i] - 'a'] --;
        if(c[s[i] - 'a'] == 0)
            g--;
    }
    vector<int> dp(n+1);
    for(int i=0;i<n;i++)
    {
        dp[i+1] = dp[a[i]] + 1;
    }
    cout << dp.back();
    return 0;
}
```

Task C ()

```cpp
#include <vector>
#include <string>
#include <iostream>
#define fi first
#define se second
#define deb if(debug)

using namespace std;

typedef long long ll;
typedef long double ld;
const bool debug = 0;

struct help
{
    help* idp;
    int i;
    help(){}
    help(help* idp,int i):idp(idp),i(i){}
};

string prog2(const int &n,const int &x,const int &y,const vector<int> &v,const vector<int> &w)
{
    vector<int> dp(x+1,-1);
    vector<help*> id(x+1,nullptr);
    help* h = new help(nullptr,-1);
    dp[0] = 0;
    id[0] = h;
    for(int i=0;i<n;i++)
    {
        for(int j = x - v[i];j>=0;j--)
        {
            if(dp[j] != -1)
            {
                if(dp[j] + w[i] > dp[j+v[i]])
                {
                    dp[j+v[i]] = dp[j] + w[i];
                    id[j+v[i]] = new help(id[j],i);
                }
            }
        }
    }
    int s = 0;
    for(int i=0;i<n;i++)
        s+=w[i];
    int im = 0;
    for(int i=0;i<=x;i++)
        if(dp[i] > dp[im])
            im = i;
    if(dp[im] + y < s)
        return "-1";
    else
    {
        string out;
        out.resize(n,'y');
        help *g = id[im];
        while(g->i >=0)
        {
            out[g->i] = 'x';
            g = g->idp;
        }

        return out;
    }
}


int main()
{
    int n,x,y;
```

```cpp
    cin >> n >> x >> y;
    vector<int> v(n),w(n);
    for(int i=0;i<n;i++)
        cin >> v[i];
    for(int i=0;i<n;i++)
        cin >> w[i];
    if(x< y)
    {
        string a = prog2(n,x,y,v,w);
        cout << a;
    }
    else
    {
        string b = prog2(n,y,x,w,v);
        if(b.size() == n)
        for(int i=0;i<n;i++)
            if(b[i] == 'x')
                b[i] = 'y';
            else
                b[i] = 'x';
        cout << b;

    }

    return 0;
}
```

Task D ()

```cpp
#include <bits/stdc++.h>
#define x first
#define y second
#define deb if(debug)

using namespace std;

typedef long long ll;
typedef long double ld;
const bool debug = 0;

int type(char a)
{
    if(a == '(' || a == ')')
        return 0;
    return 1;
}

bool f(char a, char b)
{
    if(type(a) != type(b))
    {
        return 1;
    }
    return 0;
}

int main()
{
    if(!debug)
    {
        cin.tie(0);
        cout.tie(0);
        ios::sync_with_stdio(0);
    }
    int n;
    string s;
    cin >> n >> s;
    vector<char> a;
    for(int i=0;i<2*n;i++)
    {
        if(!a.size() || f(a.back(), s[i]))
        {
            a.push_back(s[i]);
        }
        else
        {
            a.pop_back();
        }
    }
    cout << a.size() / 2;
    return 0;
}
```

Task E ()

```cpp
#include <bits/stdc++.h>
#define y first
#define x second
#define deb if(debug)

using namespace std;

typedef long long ll;
typedef long double ld;
const bool debug = 1;

int main()
{
    int t;
    string s;
    cin >> s >> t;
    while(t--)
    if(s == "add")
    {
        int n,k;
        cin >> n >> k;
        vector<int> s(k);
        for(int i=0;i<k;i++)
            cin >> s[i];
        sort(s.begin(),s.end());
        ll m = 0;
        for(int i =0;i<k;i++)
            m += s[i];
        int j = 0;
        for(int i=1;i<=n;i++)
        {
            if(i == s[j])
            {
                j ++;
            }
            else
            {
                if((m + i)%(k+1) == j)
                {
                    cout << i << '\n';
                    break;
                }
            }
        }
    }
    else
    {
        int n,k;
        cin >> n >> k;
        vector<int> s(k+1);
        for(int i=0;i<k+1;i++)
            cin >> s[i];
        sort(s.begin(),s.end());
        ll m = 0;
        for(int i =0;i<k+1;i++)
            m += s[i];
        m %= k+1;
        for(int i=0;i<k+1;i++)
            if(i != m)
                cout << s[i] << '␣';
        cout << '\n';
    }

    return 0;
}
```

Task F ()

```cpp
#include <bits/stdc++.h>
#define y first
#define x second
#define deb if(debug)

using namespace std;

typedef long long ll;
typedef long double ld;
const bool debug = 1;

int main()
{
    int n;
    cin >> n;
    cout << "4\n0_0\n1_0\n1_1\n0_1\n";
    vector<pair<int,int>> out = {{0,1},{1,0},{-1,0},{0,-1},{1,1},{-1,1},{1,-1},{-1,-1}};
    for(int i=0;i<n;i++)
    {
        cout << out[i].x << '_' << out[i].y << '\n';
    }
    return 0;
}
```