Олимпиада СПбГУ
по информатике
2023/24 учебного года

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A	B	C	D	E	F	sum
100	100	100	100	40	55	495

Task A

```
#include<iostream>

using namespace std;
#define ll long long

ll x, y, n, m, k, a[100100], ca[81][81];

ll C(ll n, ll k) {
    if (k == 0)return 1;
    if (k > n) return 0;
    //cout << n << ' ' << k << endl;
    if (ca[n][k]) return ca[n][k];
    if (n > 20) {
        ca[n][k] = C(n-1,k-1)+C(n-1,k);
        return ca[n][k];
    }
    k = max(k, n - k);
    ll ans = 1;
    for (ll i = k+1; i <= n; ++i) {
        ans *= i;
    }
    ca[n][k] = ans / a[n-k];
    return ca[n][k];
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(NULL);cout.tie(NULL);
    cin >> x >> y >> n;
```

```
    a[0] = 1;
    for(ll i = 1; i <=19; ++i) {
        a[i] = a[i-1] * i;
    }
    ll ans = 0;
    for (ll i = 0; i <= n; ++i) {
        for (ll j = 0; j <= n; ++j) {
            if (i * x + j * y == n) {
                if (i != 0)ans += C(i+j-1, i-1)*x;
                if (j != 0)ans += C(i+j-1,j-1)*y;
            }
        }
    }
    cout << ans;

}
```

Task B

```
#include <iostream>
#include <string>
using namespace std;
#define ll long long

ll x, y, z, x2, y2, z2, n, m, k, a[100100], ca[81][81];
string s, s2, s3;
ll N = 1234567891, M = 53;

ll F(ll x, ll y, ll z, ll x2, ll y2, ll z2) {
    return (abs(x - x2) + abs(y-y2) + abs(z-z2)) / 2;
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(NULL);cout.tie(NULL);
    cin >> n >>  x >> y >> z >> x2 >> y2 >> z2;
    ll ans = F(x, y, z, x2, y2, z2);
    for(ll i = 0; i <=n; ++i) {
        ans = min(ans, F(x, y, z, n, -i, i-n) + F(x2, y2, z2, -n, n-i, i)
    );
        ans = min(ans, F(x, y, z, -n, n-i, i) + F(x2, y2, z2, n, -i, i-n)
    );
        ans = min(ans, F(x, y, z, -i, n, i-n) + F(x2, y2, z2, n-i,-n, i))
    ;
        ans = min(ans, F(x, y, z, n-i,-n,  i) + F(x2, y2, z2, -i,n, i-n))
    ;
        ans = min(ans, F(x, y, z, -i, i-n, n) + F(x2, y2, z2, n-i, i,-n))
    ;
        ans = min(ans, F(x, y, z, n-i, i, -n) + F(x2, y2, z2, -i, i-n, n)
    );
    }
    cout << ans;
}
```

```
/*
first
6
001011

second
6
011001
6 852323741
*/
```

Task C

```
#include <iostream>
#include <string>
using namespace std;
#define ll long long

ll x, y, n, m, k, a[100100], ca[81][81];
string s, s2, s3;
ll N = 1234567891, M = 53;

ll max_hash(string s, ll n) {

    ll h = 0;
    a[0] = 1;
    for (ll i = 1; i <= n; ++i) {
        a[i] = a[i-1] * M % N;
    }
    for (ll i = 0; i < n; ++i) {
        h = ( h * M + (s[i]-'0'+1)) % N;
    }
    ll ma = h;
    for (ll i = 1; i <n; ++i ) {
        h = h * M % N;
        h -= a[n] * (s[i-1] -'0'+1) % N;
        h = (h + N + (s[i+n-1] - '0'+1)) % N;
        ma = max(ma, h);
    }
    return ma;
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(NULL);cout.tie(NULL);
    cin >> s;
    if (s == "first") {
        cin >> n >> s;
        cout << n << ' ' << max_hash(s+s, n);
    }
    else {
        cin >> n >> s;
        ll h;
```

```
        cin >> m >> h;
        cout << ((n == m && h == max_hash(s + s, n)) ? "YES" : "NO");
    }
}
/*
first
6
001011

second
6
011001
6 852323741
*/
```

Task D

```
#include <iostream>
#include <string>
#include <cstdio>

using namespace std;
#define ll int

ll x, y, z, x2, y2, z2, n, m, k, a[100100], ca[81][81];
string  s2, s3;
char s[1000];
ll N = 1234567891, M = 53;
char c;

char mkq(int x, int y) {
    printf("%d %d\n", x, y);
    fflush(stdout);
    scanf("%s", s);c=s[0];

    if (c == '!')exit(0);
    return c;
}
void wait(int n) {
    for (int i = 0; i < n; ++i){
        printf("1 1\n");
    }
    fflush(stdout);
    for (int i = 0; i < n; ++i){
        scanf("%s", s);c=s[0];
        if (c == '!')exit(0);
    }
}

int main() {
    //ios_base::sync_with_stdio(0);
    //cin.tie(NULL);cout.tie(NULL);
    //cin >> n;
```

```
    scanf("%d", &n);
    for (int i = 0; i < n * n; ++i) {
        int l = 1, r = 1,t=0;
        for (int j = 1; j < n; ++j) {
            if (mkq(l, r) == '>') {
                r = n;
                t=1;
            }else r = 1;

        }mkq(l,r);
        if(!t)break;
    }
    wait(n);
}
/*
first
6
001011

second
6
011001
6 852323741
*/
```

Task E

```
#include <iostream>
#include <string>
#include <cstdio>
#include <vector>
#include <algorithm>

using namespace std;

#define ll long long

ll x, y, z, x2, y2, z2, n, m, k, a[100100], ca[81][81];
string  s2, s3;
char s[1000];
ll N = 1234567891, M = 53;
char c;
vector<ll> v[100100], pos0, pos1;
ll us[100100];

void dfs(int x,int pr) {
    pos0.push_back(x);
    if(!us[x]){us[x] = 1;k++;}
    for (int i = 0; i < v[x].size(); ++i) {
        int to = v[x][i];
        if (to == pr) {
            if(i!=v[x].size()-1)rotate(v[x].begin(), v[x].begin()+i+1, v[
    x].end());
```

```
            return;
        }
        dfs(to, x);
        pos0.push_back(x);
    }
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(NULL);cout.tie(NULL);
    cin >> n >> m;
    for (int i = 0; i < n; ++i) {
        cin >> x;
        for (int j  =0;j<x; ++j) {
            cin >> y;
            v[i].push_back(y-1);
        }
    }
    vector<ll>zap;
    ll ma = 0;
    while(m--){
        cin >> x;
        zap.push_back(x);
        ma = max(ma, x);
    }
    if (ma <= 2e5) {
        ll t= 0;y=0;
        for (auto x: zap) {
            z = x;x-=y;
            y=z;
            while(x--) {
                rotate(v[t].begin(), v[t].begin()+1, v[t].end());
                t= v[t][v[t].size()-1];
            }
            cout << t+1 << ' ';
        }
    }
    else {
        while(k!=n){dfs(0, -1);pos0.pop_back();}
        pos1 = pos0;
        pos0 = {};
        dfs(0, -1);pos0.pop_back();
        for (auto x: zap) {
            if (x < pos1.size()) {
                cout << pos1[x] + 1 << ' ';
                continue;
            }
            ll t = (x - pos1.size())%(pos0.size());
            cout << pos0[t] + 1 << ' ';
        }
    }
}
/*
```

```
6 36
2 3 2
2 4 1
3 1 5 6
1 2
1 3
1 3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
     28 29 30 31 32 33 34 35
*/
```

Task F

```
#include <iostream>
#include <string>
#include <cstdio>
#include <vector>
#include <algorithm>

using namespace std;

#define ll long long

ll x, y, z, x2, y2, z2, n, m, k, a[100100], ca[81][81];
string  s2, s3;
string s[1000];
ll N = 1234567891, M = 53;
char c;
vector<ll> v[100100], pos0, pos1;
ll us[100100];


int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(NULL);cout.tie(NULL);
    cin >> n >> m;
    ll ans = 0;
    string sa[1000];
    for (int i  =0;i<n; ++i) {
        cin >> s[i];
        ll lans = 0, rans = 0;
        string ss,ss2;
        for (int j = 0; j < m; ++j) {
            if (j % 2) {
                ss+="LR";
                lans += (s[i][j]-'0')*(s[i][j-1]-'0');
            }
        }
        if (m %2)ss+=".";
        for (int j = 0; j < m; ++j) {
            if (j % 2 == 0 && j > 0) {
                ss2+="LR";
                rans += (s[i][j]-'0')*(s[i][j-1]-'0');
```

```
            }
        }
        if (m %2 == 0){ss2 = "R" + ss2 + "L";rans += (s[i][0]-'0')*(s[i][
    m-1]-'0');}
        else ss2 = "."+ss2;
        if(lans < rans){
            ans += rans;
            sa[i] = ss2;
        }else {
            ans +=lans;
            sa[i]+=ss;
        }

    }

    cout << ans << endl;
    for (int i = 0; i < n; ++i)cout << sa[i]<<endl;
}
/*
6 36
2 3 2
2 4 1
3 1 5 6
1 2
1 3
1 3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
     28 29 30 31 32 33 34 35
*/
```