Олимпиада СПбГУ по информатике 2018/19 учебного года

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A	B	C	D	E	F	Sum
100	100	100	60	100	7	467

Task A (100)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;

int main(){

    Power;

    int n,m;
    cin >> n >> m;
    int t = m/n;
    t = log2(t);
    t = pow(2,t);
    if(n*t==m)
        cout << "Yes";
    else
        cout << "No";

    return 0;
}
```

Task B (100)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>
#include<algorithm>
#include<string>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;

int main(){

    Power;

    int n;
    cin >> n;
    char a,b,c;
    a=b=c='#';
    bool tof = false;
    for(int i=0;i<n;i++){
        char x;
        cin >> x;
        a=b;
        b=c;
        c=x;
        if(a=='o' && (b=='r' || c=='r')){
            tof = true;
            break;
        }
        if(b=='o' && (a=='r' || c=='r')){
            tof = true;
            break;
        }
        if(c=='o' && (b=='r')){
            tof = true;
            break;
        }
    }

    if(tof)
        cout << "Yes";
    else
        cout << "No";

    return 0;
}
```

Task C (100)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>
#include<algorithm>
#include<string>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;

vector<vector<int> > t;
vector<int> cnt;

vector<int> ans;

void dfs(int v, int p=-1){
    cnt[v] = 1;
    int q = t[v].size();
    for(int i=0;i<q;i++){
        int to = t[v][i];
        if(to!=p){
            dfs(to,v);
            cnt[v]+=cnt[to];
        }
    }
}

void solve(int v, int p=-1){
    int m = 0;
    int q = t[v].size();
    for(int i=0;i<q;i++){
        int to = t[v][i];
        m = max(m,cnt[to]);
    }
    ans[v] = m+1;
    for(int i=0;i<q;i++){
        int to = t[v][i];
        if(to!=p){
            cnt[v] -= cnt[to];
            cnt[to] += cnt[v];
            solve(to,v);
            cnt[to] -= cnt[v];
            cnt[v] += cnt[to];
        }
    }
}

int main(){

    Power;

    int n;
    cin >> n;
    t = vector<vector<int> >(n);
    for(int i=1;i<n;i++){
        int a,b;
        cin >> a >> b;
        a--;
        b--;
        t[a].push_back(b);
        t[b].push_back(a);
    }

    cnt.assign(n,0);
```

```cpp
    dfs(0);

    ans = vector<int>(n,-1);

    solve(0);

    for(int i=0;i<n;i++)
        cout << ans[i] << " ";

    return 0;
}
```

Task D (60)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>
#include<algorithm>
#include<string>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;

int main(){

    Power;

    string s;
    cin >> s;
    int t,n,p;
    cin >> t >> n >> p;
    if(s=="split"){
        for(int q=0;q<t;q++){
            string a,b,c;
            a="a";
            b="b";
            c="c";
            cin >> s;
            string x,y,z;
            x=y=z="";
            for(int i=0;i<3;i++)
                x+=s[i];
            for(int i=3;i<6;i++)
                y+=s[i];
            for(int i=6;i<9;i++)
                z+=s[i];
            a += x + y;
            b += x + z;
            c += y + z;
            int e = n%3;
            int v = n/3;
            x = a;
            for(int i=0;i<e;i++){
                for(int j=0;j<=v;j++)
                    cout << x << " ";
                if(x==a) x = b;
                else x = c;
            }
            for(int i=e;i<3;i++){
                for(int j=0;j<v;j++)
                    cout << x << " ";
                if(x==a) x = b;
                else x = c;
            }
            cout << "\n";
        }
    }else{
        for(int q=0;q<t;q++){
            int v = (n+1)/2;
            string a,b,c;
            a=b=c="#";
            for(int i=0;i<v;i++){
                string x;
                cin >> x;
                if(x[0]=='a')
                    a = x;
                else if(x[0] == 'b')
```

```cpp
                    b = x;
                else
                    c = x;
        }
        string ans;
        ans.resize(9);
        if(a!="#")
            ans[0] = a[1], ans[1] = a[2], ans[2] = a[3], ans[3] = a[4], ans[4] = a[5], ans[5]
                = a[6];
        if(b!="#")
            ans[0] = b[1], ans[1] = b[2], ans[2] = b[3], ans[6] = b[4], ans[7] = b[5], ans[8]
                = b[6];
        if(c!="#")
            ans[3] = c[1], ans[4] = c[2], ans[5] = c[3], ans[6] = c[4], ans[7] = c[5], ans[8]
                = c[6];
        cout << ans << "\n";
    }
}

    return 0;
}
```

Task E (100)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>
#include<algorithm>
#include<string>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;

struct Point{
    ll x,y;
    Point(){}
    Point(ll x,ll y): x(x), y(y){}
};

Point operator - (const Point& a, const Point& b){
    return Point(a.x-b.x, a.y-b.y);
}

Point Rot(Point x, Point t){
    return Point(x.x*t.y-x.y*t.x, x.x*t.x+x.y*t.y);
}

bool operator < (const Point& a,const Point& b){
    return (a.y < b.y) || (a.y==b.y && a.x > b.x);
}

bool operator == (const Point& a,const Point& b){
    return (a.y == b.y) && (a.x==b.x);
}

int main(){

    Power;

    int n;
    cin >> n;

    vector<pair<Point, int> > G(n);

    for(int i=0;i<n;i++)
        cin >> G[i].first.x >> G[i].first.y, G[i].second=i+1;


    Point P,Q;
    cin >> P.x >> P.y >> Q.x >> Q.y;

    Point t = Q-P;

    for(int i=0;i<n;i++)
        G[i].first = G[i].first - P;

    for(int i=0;i<n;i++)
        G[i].first = Rot(G[i].first, t), G[i].first.x = abs(G[i].first.x);

    sort(G.begin(), G.end());

    reverse(G.begin(), G.end());

    Point pre = G[0].first;
    for(int i=1;i<n;i++)
        if(G[i].first==pre){
            cout << -1;
```

```cpp
            return 0;
        }

    cout << G[0].second;

    return 0;
}
```

Task F (7)

```cpp
#include<iostream>
#include<set>
#include<vector>
#include<map>
#include<math.h>
#include<algorithm>
#include<string>
#include<bitset>

using namespace std;

#define Power ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0);

typedef long long int ll;
typedef pair<int,int> pp;
typedef bitset<100000> bt;


int main(){

    Power;

    int n;
    int k;
    cin >> n >> k;
    vector<int> a(n),b(n);
    for(int i=0;i<n;i++){
        cin >> a[i] >> b[i];
    }

    int ans = 0;

    for(int i=0;i<pow(2,n);i++){
        bt q(i);
        int x=0,y=0;
        int cnt=0;
        for(int j=0;j<n;j++){
            if(q[j])
                x+=k;
            else
                y+=k;
            cnt += x;
            cnt += y;
            x-=a[j];
            y-=b[j];
            if(x<0) x=0;
            if(y<0) y=0;
            cnt -= y;
            cnt -= x;
        }
        ans = max(ans,cnt);
    }

    cout << ans;

    return 0;
}
```