Олимпиада СПбГУ
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A	B	C	D	E	F	sum
100	100	100	100	60	92	552

Task A

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;

void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
#ifdef LOCAL
    ifstream fin("C:\\         \\  \\vvod.txt");
    #define cin fin
#endif
int32_t main(){
  // opt();
  int a,b,n;
  cin>>a>>b>>n;
  if(a==b){
        if(n%a==0){
            cout<<a<<"\n";
        } else {
            cout<<0<<"\n";
        }
        return 0;
  }
  vector<int> dp(n+1,0);
  dp[0]=1;
  for(int i=1;i<=n;i++){
```

```
        if(i>=a){
            dp[i]+=dp[i-a];
        }
        if(i>=b){
            dp[i]+=dp[i-b];
        }
  }
  int ans=0;
  if(n>=a){
        ans+=dp[n-a]*a;
  }
  if(n>=b){
        ans+=dp[n-b]*b;
  }
  cout<<ans<<"\n";
  return 0;
}
```

Task B

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;

void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
#ifdef LOCAL
    ifstream fin("C:\\         \\  \\vvod.txt");
    #define cin fin
#endif
int dist(int x1, int y1, int z1, int x2, int y2, int z2){
    return (abs(x1-x2)+abs(y1-y2)+abs(z1-z2))/2;
}
int32_t main(){
  opt();
  int n,x1,y1,x2,y2,z1,z2;
  cin>>n>>x1>>y1>>z1>>x2>>y2>>z2;
  int finalans=inf;
  for(int j=-1;j<=1;j++){
        for(int k=-1;k<=1;k++){
            for(int l=-1;l<=1;l++){
                // cout<<j<<" "<<k<<" "<<l<<" "<<x1+2*n*j-n*k-n*l<<" "<<
    y1+2*n*k-n*j-n*l<<" "<<z1+2*n*l-n*j-n*k<<"\n";
                finalans=min(finalans,dist(x1+2*n*j-n*k-n*l,y1+2*n*k-n*j-
    n*l,z1+2*n*l-n*j-n*k,x2,y2,z2));
            }
        }
  }
  cout<<finalans<<"\n";
```

```
  return 0;
}
```

Task C

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;

void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
#ifdef LOCAL
    ifstream fin("C:\\        \\  \\vvod.txt");
    #define cin fin
#endif
const int b=3;
const int mod=1e9+7;
vector<int> stepen,mainhash;
int get(int l, int r){
    return (mod + mainhash[r]-(mainhash[l]*stepen[r-l])%mod)%mod;
}
int32_t main(){
  opt();
  string s;
  cin>>s;
  if(s=="first"){
        int n;
        cin>>n;
        string base;
        cin>>base;
        base+=base;
        mainhash.assign(2*n+1,0);
        for(int i=0;i<base.size();i++){
            mainhash[i+1]=(mainhash[i]*b+(base[i]-'0'+1))%mod;
        }
        stepen.assign(n+1,1);
        for(int i=1;i<=n;i++){
            stepen[i]=(stepen[i-1]*b)%mod;
        }
        int optimal=0;
        for(int i=1;i<n;i++){
            if(get(i,i+n)!=get(optimal,optimal+n)){
                int l=0;
                int r=n;
                while(r-l!=1){
                    int mid=(l+r)/2;
                    if(get(i,i+mid)==get(optimal,optimal+mid)){
                        l=mid;
                    } else {
```

```
                        r=mid;
                    }
                }
                if(base[i+l]<base[optimal+l]){
                    optimal=i;
                }
            }
        }
        cout<<get(optimal,optimal+n)<<"\n";
    } else {
        int n;
        cin>>n;
        string base;
        cin>>base;
        int lastans;
        cin>>lastans;
        base+=base;
        mainhash.assign(2*n+1,0);
        for(int i=0;i<base.size();i++){
            mainhash[i+1]=(mainhash[i]*b+(base[i]-'0'+1))%mod;
        }
        stepen.assign(n+1,1);
        for(int i=1;i<=n;i++){
            stepen[i]=(stepen[i-1]*b)%mod;
        }
        int optimal=0;
        for(int i=1;i<n;i++){
            if(get(i,i+n)!=get(optimal,optimal+n)){
                int l=0;
                int r=n;
                while(r-l!=1){
                    int mid=(l+r)/2;
                    if(get(i,i+mid)==get(optimal,optimal+mid)){
                        l=mid;
                    } else {
                        r=mid;
                    }
                }
                if(base[i+l]<base[optimal+l]){
                    optimal=i;
                }
            }
        }
        if(lastans==get(optimal,optimal+n)){
            cout<<"YES\n";
        } else{
            cout<<"NO\n";
        }
    }
    return 0;
}
```

Task D

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;

void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
/*#ifdef LOCAL
    ifstream fin("C:\\        \\  \\vvod.txt");
    #define cin fin
#endif*/
int n;
int convert(int x, int curbegin){
    return (x-curbegin+n)%n;
}

int32_t main(){
  // opt();
  cin>>n;
  string ans1;
  vector<int> ans(n,-1);
  deque<int> base(n);
  for(int i=0;i<n;i++) base[i]=i;
  for(int t=1;t<=n;t++){
      vector<bool> compared(n,0);
      int cnt=1;
      compared[base[0]]=1;
        while(cnt!=n){
            if(ans[base[1]]!=-1){
                if(!compared[base[1]]){
                    compared[base[1]]=1;
                    cnt++;
                }
            }
            if(compared[base[1]]){
                cout<<"1 2\n";
                swap(base[1],base[0]);
                base.push_back(base[0]);
                base.pop_front();
                cout.flush();
                cin>>ans1;
                if(ans1=="!") return 0;
                continue;
            }
                cout<<"1 1\n";
                cout.flush();
                cin>>ans1;
                if(ans1=="!") return 0;
```

```
                if(ans1=="<" || ans[base[0]]!=-1){
                    compared[base[1]]=1;
                    cnt++;
                    base.push_back(base[0]);
                    base.pop_front();
                } else {
                    compared[base[1]]=1;
                    cnt++;
                    base.push_back(base[0]);
                    base.pop_front();
                    cout<<n<<" 2\n";
                    swap(base[n-1],base[1]);
                    base.push_back(base[0]);
                    base.pop_front();
                    cout.flush();
                    cin>>ans1;
                    if(ans1=="!") return 0;
                }
        }
        ans[base[0]]=t;
  }
  int curbegin=0;
    for(int i=0;i<n;i++){
        for(int j=i;j<n;j++){
            if(ans[base[j]]==n-i){
                swap(base[i],base[j]);
                cout<<convert(i,curbegin)+1<<" "<<convert(j,curbegin)+1<<
   "\n";
                cout.flush();
                cin>>ans1;
                if(ans1=="!") return 0;
                curbegin++;
                curbegin%=n;
                break;
            }
        }
    }
    for(int i=0;i<n+1;i++){
        cout<<"1 1\n";
        cout.flush();
        cin>>ans1;
        if(ans1=="!") return 0;
    }
  return 0;
}
```

Task E

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;
```

```
void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
#ifdef LOCAL
    ifstream fin("C:\\         \\   \\vvod.txt");
    #define cin fin
#endif
vector<deque<int>> g;
vector<int>p1,dp,pos;
void dfs(int v){
    int add=0;
    for(int i=0;i<g[v].size();i++){
        if(g[v][i]==p1[v]){
            pos[v]=i;
            add++;
            continue;
        }
        dp[g[v][i]]=dp[v]+add;
        p1[g[v][i]]=v;
        dfs(g[v][i]);
    }
}
vector<vector<int>> base1;
void solve(int v, int x){
    // cout<<v<<" "<<x<<"\n";
    if(v==0){
        for(auto i:g[v]){
            base1[x].push_back(i);
            solve(i,x);
            base1[x].push_back(v);
        }
    } else {
        if(dp[v]==x){
            for(int i=0;i<pos[v];i++){
                if(dp[g[v][i]]<=x){
                    base1[x].push_back(g[v][i]);
                    solve(g[v][i],x);
                    base1[x].push_back(v);
                }
            }
        } else {
            for(int i=0;i+1<g[v].size();i++){
                if(dp[g[v][(i+pos[v]+1)%g[v].size()]]<=x){
                    base1[x].push_back(g[v][(i+pos[v]+1)%g[v].size()]);
                    solve(g[v][(i+pos[v]+1)%g[v].size()],x);
                    base1[x].push_back(v);
                }
            }
        }
    }
}
```

```
int32_t main(){
  // opt();
  int n,q;
  cin>>n>>q;
  base1.assign(n,vector<int>());
  pos.assign(n,0);
  p1.assign(n,0);
  dp.assign(n,0);
  g.assign(n,deque<int>());
  for(int i=0;i<n;i++){
        int x;
        cin>>x;
        for(int j=0;j<x;j++){
            int y;
            cin>>y;
            g[i].push_back(y-1);
        }
  }
  dfs(0);
  /*for(auto i:dp){
        cout<<i<<" ";
  }
  cout<<"\n";
  for(auto i:pos){
        cout<<i<<" ";
  }
  cout<<"\n";*/
  vector<int> cnt(n);
  for(int i=0;i<n;i++){
        cnt[dp[i]]++;
  }
  for(int i=1;i<n;i++){
        cnt[i]+=cnt[i-1];
  }
    for(int i=0;i<q;i++){
        int x;
        cin>>x;
        if(x==0){
            cout<<"1 ";
            continue;
        }
        x--;
        for(int i=0;i<n;i++){
            // cout<<i<<" "<<x<<" "<<cnt[i]<<"\n";
            if(x<2*(cnt[i]-1) || i+1==n){
                x%=2*(cnt[i]-1);
                if(base1[i].size()==0){
                    solve(0,i);
                }
                cout<<base1[i][x]+1<<" ";
                break;
            } else {
                x-=2*(cnt[i]-1);
```

```
            }
        }
    }
    cout<<"\n";
  return 0;
}
```

Task F

```
#include <bits/stdc++.h>
#define all(x) x.begin(),x.end()
#define int long long
const int inf=1e17;
using namespace std;

void opt(){
  ios::sync_with_stdio(false);
  cin.tie(0);
}
#ifdef LOCAL
    ifstream fin("C:\\        \\  \\vvod.txt");
    #define cin fin
#endif
const int compare=7e8;
int32_t main(){
  opt();
  int h,w;
  cin>>h>>w;
  mt19937 rnd(4);
  vector<string> val(h);
  for(int i=0;i<h;i++) cin>>val[i];
  vector<string> finale;
  int superfinale=-1;
  for(int i=0;i<80;i++){
      int finalans=0;
      bool pos=1;
        vector<string> ans(h,string(w,'.'));
        while(pos){
            pos=0;
            int max1=-inf;
            int posx=0;
            int posy=0;
            int max2=-inf;
            int pos1x=0;
            int pos1y=0;
            for(int i=0;i<h;i++){
                for(int j=0;j<w;j++){
                    if(ans[i][j]=='.' && ans[(i+1)%h][j]=='.'&& (val[i][j
    ]-'0')*(val[(i+1)%h][j]-'0')>max1){
                        max1=(val[i][j]-'0')*(val[(i+1)%h][j]-'0');
                        posx=i;
                        posy=j;
                        pos=1;
```

```
                        if(i!=0 && rnd()<compare) break;
                    }
                    if(ans[i][j]=='.' && ans[i][(j+1)%w]=='.'&& (val[i][j
    ]-'0')*(val[i][(j+1)%w]-'0')>max2){
                        max2=(val[i][j]-'0')*(val[i][(j+1)%w]-'0');
                        pos1x=i;
                        pos1y=j;
                        pos=1;
                        if(i!=0 && rnd()<compare) break;
                    }
                }
            }
            if(pos){
                if(max1!=-inf && rnd()%2==0){
                    finalans+=max1;
                    ans[posx][posy]='T';
                    ans[(posx+1)%h][posy]='B';
                } else {
                    finalans+=max2;
                    ans[pos1x][pos1y]='L';
                    ans[pos1x][(pos1y+1)%w]='R';
                }
            }
        }
        if(finalans>superfinale){
            superfinale=finalans;
            finale=ans;
        }
    }
    cout<<superfinale<<"\n";
    for(auto i:finale){
        cout<<i<<"\n";
    }
    cout<<"\n";
    return 0;
}
```