

Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	58	84	542

Task A ()

```
#pragma GCC optimize("Ofast")
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define int long long
#define ull unsigned long long

signed main() {
    std::ios_base::sync_with_stdio(0);
    cin.tie(0);
    int n;
    cin >> n;
    map<int, int> mp;
    int mn = 2e9;
    for (int i = 0; i < n; ++i) {
        int a, b;
        cin >> a >> b;
        mn = min(mn, b);
        string s = to_string(a);
        reverse(s.begin(), s.end());
        for (int i = 0; i < s.size(); ++i)
            mp[i + b] += s[i] - '0';
    }
    int ans = mn;
    for (int i = mn; ++i) {
        int c = mp[i] / 10;
        int r = mp[i] % 10;
        if (r == 0) {
            ans++;
            mp[i + 1] += c;
        } else
            break;
    }
    cout << ans;
    return 0;
}
```

Task B ()

```
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <random>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define ull unsigned long long
signed main() {

    int n;
    cin>>n;
    vector<int> k(n+1);
    for (int i=1;i<=n;++i)
        cin>>k[i];
    int I=n;
    while (I-1>=0 && k[I]==0)
        I--;
    if (I==0)
    {
        cout<<"Stop"<<endl;
        return 0;
    }
    int cooked=0;
    cout<<"Flip_and_wait"<<endl;
    while (true)
    {
        string s;
        cin>>s;
        if (s=="Burn" || s=="Tired" || s=="Fail")
        {
            return 0;
        }
        int cur = s.size()-3; cur/=2;
        cooked+=cur;
        if (cooked>=I)
        {
            cooked=0;
            k[I]--;
            while (k[I]==0 && I-1>=0)
                I--;

            if (I==0)
            {
                cout<<"Stop"<<endl;
                break;
            } else
            {
                cout<<"Flip_and_wait"<<endl;
            }
        }
        else
        {
            cout<<"Wait"<<endl;
        }
    }
    return 0;
}
```

Task C ()

```
#pragma GCC optimize("Ofast")
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <random>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define int long long
#define ull unsigned long long
ll mod=998244353;
vector<map<string, string>> mp, rmp;
bool FL=1;
void calc(int n) {
    set<string> qt;
    for (int mask = 0; mask < (1 << n); ++mask) {
        string opa;
        for (int i=0; i<n; ++i)
        {
            if ((mask & (1<<i))!=0)
                opa+='1';
            else
                opa+='0';
        }
        qt.insert(opa);
    }
    set<string> st;
    for (int mask = 0; mask < (1 << n) && !qt.empty(); ++mask) {
        int bt = __builtin_popcount(mask);
        if (bt < n / 2)
            continue;
        vector<string> del;
        for (auto T:qt) {
            auto t=T;
            for (int i = 0; i < n; ++i) {
                if ((mask & (1 << i)) != 0)
                    t[i] = '?';
            }
            if (!st.count(t)) {
                st.insert(t);
                del.push_back(T);
                mp[n][T]=t;
                rmp[n][t]=T;
            }
        }
        for (auto u:del)
            qt.erase(u);
    }
    if (!qt.empty())
        FL = 0;
}
mt19937 g(4901341);
pair<int, int> gt(int n) {
    int i1, i2;

    i1 = 179971 % n;
    i1 *= 2313911;
    i1 %= n;
    i1 += 911231210;
    i1 %= n;
    i2 = i1 + n / 2;
    i2 %= n;
    i2 += 10;
    i2 %= n;
    if (i1 == i2) {
        i2++;
        i2 %= n;
    }
```

```

    }
    if (i1 > i2)
        swap(i1, i2);
    return {i1, i2};
}
signed main() {
    std::ios_base::sync_with_stdio(0);
    cin.tie(0);
    mp.resize(11);
    rmp.resize(11);

    vector<pair<int, int>> ban(2e5 + 10);
    for (int i = 2; i <= 10; i += 2) {
        FL = 1;
        calc(i);
    }
    for (int i = 100; i <= 2e5 + 2; i += 2) {

        ban[i] = gt(i);
    }

    int q;
    cin >> q;

    while (q--) {
        string s;
        cin >> s;
        int n = s.size();
        int test = 1;
        if (s.find('?') != s.npos)
            test = 2;
        if (n % 2 == 1) {
            if (test == 1) {
                vector<int> c(2);
                for (auto u:s)
                    c[u - '0']++;

                int nx;
                if (c[0] > c[1])
                    nx = 0;
                else
                    nx = 1;
                if (c[nx] == n) {
                    for (int j = 0; j < n / 2; ++j)
                        s[j] = '?';
                } else {
                    for (int j = 0; j < n; ++j) {
                        if (s[j] - '0' == nx)
                            s[j] = '?';
                    }
                }
                cout << s << '\n';
            } else {
                int vp = 0;
                int bt = 0;
                for (auto u:s) {
                    if (u != '?')
                        bt = u - '0';
                    else
                        vp++;
                }
                if (vp == n / 2) {
                    for (int j = 0; j < n; ++j) {
                        if (s[j] == '?')
                            s[j] = char('0' + bt);
                    }
                } else {
                    for (int j = 0; j < n; ++j) {
                        if (s[j] == '?')
                            s[j] = char('0' + 1 - bt);
                    }
                }
            }
        }
    }
}

```

```

        cout << s << '\n';
    }

} else {
    if (n <= 10) {
        if (test == 1)
            cout << mp[n][s] << '\n';
        else
            cout << rmp[n][s] << '\n';
    } else {
        if (test == 1) {
            vector<int> c(2);
            for (auto u:s)
                c[u - '0']++;
            int bt;
            if (c[0] >= c[1])
                bt = 0;
            else
                bt = 1;
            if (c[bt] == n) {
                s = string(n, '?');
                s[ban[n].first] = char(bt + '0');
                s[ban[n].second] = char(bt + '0');
            } else {
                for (int j = 0; j < n; ++j) {
                    if (s[j] - '0' == bt)
                        s[j] = '?';
                }
            }
            cout << s << '\n';
        } else {
            int vp = 0;
            int bt = 0;
            vector<int> vp1;
            for (int j = 0; j < n; ++j) {
                if (s[j] == '?')
                    vp++;
                else
                    bt = s[j] - '0', vp1.push_back(j);
            }
            if (vp1.size() == 2 && vp1[0] == ban[n].first && vp1[1] == ban[n].second) {
                s = string(n, char('0' + bt));
            } else {
                for (int i = 0; i < n; ++i) {
                    if (s[i] == '?')
                        s[i] = char('0' + 1 - bt);
                }
            }
            cout << s << '\n';
        }
    }
}

}

}

return 0;
}

```

Task D ()

```
#pragma GCC optimize("Ofast")

#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define int long long
#define ull unsigned long long
ll mod= 998244353;
ll bp(ll a, ll n) {
    if (n == 0)
        return 1;
    if (n % 2 == 0) {
        ll b = bp(a, n / 2);
        return b * b % mod;
    } else
        return a * bp(a, n - 1) % mod;
}
ll inv(ll a) {
    return bp(a, mod - 2);
}
ll get(ll n)
{
    if (n==0)
        return 1ll;
    ll N = 1e8;
    vector<ll> pr = {1, 808258749, 117153405, 761699708, 573994984, 62402409, 511621808,
        242726978, 887890124, 875880304};
    ll ans = pr[n / N];

    for (ll i = (n / N) * N + 1; i <= n; ++i)
        ans = (ans * i) % mod;
    return ans;
}
ll fact(ll n)
{
    ll ans=1;
    for (ll i=1;i<=n;++i)
    {
        if (i%mod==0)
            continue;
        ans*=i;
        ans%=mod;
    }
    return ans;
}
signed main() {

    ios_base::sync_with_stdio(0);
    cin.tie(0);
    ll n;
    cin >> n;
    n++;
    //cout<<fact(n)<<'\n';

    ll Q = 0;
    Q = n / mod + n / (1ll*mod * mod);
    cout << Q << '┐';

    ll kol = n / mod;
    ll cur0 = 1;
    if (kol % 2 == 0)
        cur0 = 1;
    else
        cur0 = mod - 1;
```

```
n%=mod;
cout<<(get(n)*cur0)%mod;
return 0;
}
```

Task E ()

```
#pragma GCC optimize("Ofast")
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define int long long
#define ull unsigned long long
int mod= 998244353;
signed main() {
    std::ios_base::sync_with_stdio(0);
    cin.tie(0);
    int n, q;
    cin>>n;
    vector<int> v(n);
    for (int i=0;i<n;++i)
        cin>>v[i];
    cin>>q;
    while(q--){
        int a, b, k;
        cin>>a>>b>>k;
        int ans=0;
        for (int i=a;i<b;++i)
        {
            ans+=(k+v[i]-1)/v[i];
        }
        cout<<ans<<'\n';
    }
    return 0;
}
//
```


Task F ()

```
#pragma GCC optimize("Ofast")
#include <iostream>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <cstdlib>
#include <string.h>
#include <set>
#include <map>
using namespace std;
#define ll long long
#define int long long
#define ull unsigned long long
int mod= 998244353;
signed main() {
    std::ios_base::sync_with_stdio(0);
    cin.tie(0);
    int n;
    cin >> n;
    vector<pair<int, int>> pr(n);
    for (int i = 0; i < n; ++i) {
        cin >> pr[i].first >> pr[i].second;
    }
    vector<int> dp(n + 1, 1);

    for (int i = 1; i <= n; ++i) {
        ll L = 0, R = 0;
        for (int j = i - 1; j >= 0 && j >= i - 2000; --j) {
            L += pr[j].first;
            R += pr[j].second;
            if (L <= 0 && 0 <= R)
                dp[i] = max(dp[i], 1 + dp[j]);
        }
    }
    ll ans = 0;
    for (int i = 0; i <= n; ++i)
        ans = max(ans, dp[i]);

    cout<<ans;

    return 0;
}
//
//
```