

Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	60	58	31	449

Task A ()

```
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

signed main() {
    ios_base::sync_with_stdio(0);

    int n;
    cin >> n;

    map< int, ll > v;
    for (int i = 0; i < n; i++) {
        ll val, cnt;
        cin >> val >> cnt;

        for (; val > 0 && val % 10 == 0; val /= 10, cnt++) {}

        v[cnt] += val;
    }

    for (map< int, ll >::iterator it = v.begin(); it != v.end(); it++) {
        ll val = it->second, cnt0 = it->first, cnt = it->first;

        for (; val > 0 && val % 10 == 0; val /= 10, cnt++) {}

        if (cnt == cnt0) {
            cout << cnt << "\n";
            return 0;
        }

        v[cnt] += val;
    }

    return 0;
}
```

Task B ()

```
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

signed main() {
    ios_base::sync_with_stdio(0);

    int n;
    cin >> n;

    int sm = 0;
    vector< int > k(n);
    for (int& el : k) {
        cin >> el;

        sm += el;
    }

    int p = n - 1;
    for (; k[p] == 0; p--) {}

    cout << "Flip_and_wait" << endl;
    for (int i = 0; sm > 0; ) {
        string res;
        cin >> res;

        i += (res.size() - 3) / 2;

        if (i <= p)
            cout << "Wait" << endl;
        else {
            k[p]--;
            sm--;
            if (sm == 0)
                break;
            for (; k[p] == 0; p--) {}
            i = 0;
            cout << "Flip_and_wait" << endl;
        }
    }

    cout << "Stop" << endl;

    return 0;
}
```

Task C ()

```
#include <random>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

const int MD = 998244353;

struct ULL {
    ll val, cnt;

    ULL(ll val, ll cnt = 0) {
        this->cnt = cnt;
        this->val = val;
        for (; this->val > 0 && this->val % MD == 0; this->val /= MD, this->cnt++) {}
        this->val %= MD;
    }

    ULL operator *(ll v) {
        return ULL(val * v, cnt);
    }

    ULL operator +(ULL v) {
        if (cnt < v.cnt)
            return *this;
        if (cnt > v.cnt)
            return v;
        return ULL(val + v.val, cnt);
    }
};

signed main() {
    ios_base::sync_with_stdio(0);

    int t;
    cin >> t;

    for (; t; t--) {
        string s;
        cin >> s;

        bool ch = true;
        for (char c : s)
            ch = ch && c != '?';

        if (ch) {
            if (s.size() == 2) {
                int m = 0;
                for (int i = 0; i < s.size(); i++) {
                    m *= 2;
                    if (s[i] == '1')
                        m++;
                }
                if (m == 0)
                    cout << "0?\n";
                else if (m == 1)
                    cout << "1?\n";
                else if (m == 2)
                    cout << "1?\n";
                else
                    cout << "??\n";
            }
        }
    }
}
```

```

        continue;
    }

    int c0 = 0, c1 = 0;
    for (char c : s) {
        c0 += c == '0';
        c1 += c == '1';
    }
    if (c0 > c1) {
        for (char& c : s) {
            if (c == '0')
                c = '?';
        }
    }
    else if (c0 > 0) {
        for (char& c : s) {
            if (c == '1')
                c = '?';
        }
    }
    else {
        int n = s.size();
        if (n % 2 == 1) {
            for (int i = 0; i < n / 2; i++)
                s[i] = '?';
        }
        else {
            mt19937 gen;
            gen.seed(n);
            vector<int> ord(n);
            for (int i = 0; i < n; i++)
                ord[i] = i;
            for (int i = 0; i < n; i++)
                swap(ord[i], ord[i + gen() % (n - i)]);
            for (int i = 0; i < (n - 1) / 2 + 1; i++)
                s[ord[i]] = '?';
        }
    }
    cout << s << "\n";
}
else {
    if (s.size() == 2) {
        if (s == "0?")
            cout << "00\n";
        else if (s == "?1")
            cout << "01\n";
        else if (s == "1?")
            cout << "10\n";
        else
            cout << "11\n";
        continue;
    }

    int n = s.size();
    if (n % 2 == 1) {
        string fl(n, '1');
        for (int i = 0; i < n / 2; i++)
            fl[i] = '?';
        if (fl == s) {
            for (int i = 0; i < n; i++)
                cout << "1";
            cout << "\n";
            continue;
        }
    }
    else {
        mt19937 gen;
        gen.seed(n);
        vector<int> ord(n);
        for (int i = 0; i < n; i++)
            ord[i] = i;
        for (int i = 0; i < n; i++)
            swap(ord[i], ord[i + gen() % (n - i)]);
        string fl(n, '1');

```

```

        for (int i = 0; i < (n - 1) / 2 + 1; i++)
            fl[ord[i]] = '?';
        if (fl == s) {
            for (int i = 0; i < n; i++)
                cout << "1";
            cout << "\n";
            continue;
        }
    }

    int c0 = 0, c1 = 0;
    for (char c : s) {
        c0 += c == '0';
        c1 += c == '1';
    }

    if (c0 > 0) {
        for (int i = 0; i < n; i++) {
            if (s[i] == '?')
                s[i] = '1';
        }
    }
    else {
        for (int i = 0; i < n; i++) {
            if (s[i] == '?')
                s[i] = '0';
        }
    }
    cout << s << "\n";
}

/*ll n;
cin >> n;

ULL a = 1, b = 2;
for (ll i = 2; i <= n; i++) {
    ULL c = b + a * i * i;

    a = b;
    b = c;
}

cout << b.cnt << " " << b.val << "\n";*/

/*int n;
cin >> n;

vector < int > v(n);
for (int i = 0; i < n; i++)
    cin >> v[i];

int q;
cin >> q;

for (; q; q--) {
    int a, b, d;
    cin >> a >> b >> d;

    ll cnt = 0;
    for (int i = a; i < b; i++)
        cnt += (d - 1) / v[i] + 1;

    cout << cnt << "\n";
}*/

return 0;
}
/*
8
???
??1
?1?
0??

```

1??
?0?
??0
?11
*/

Task D ()

```
#include <random>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

const int MD = 998244353;

struct ULL {
    ll val, cnt;

    ULL(ll val, ll cnt = 0) {
        this->cnt = cnt;
        this->val = val;
        for (; this->val > 0 && this->val % MD == 0; this->val /= MD, this->cnt++) {}
        this->val %= MD;
    }

    ULL operator *(ll v) {
        return ULL(val * v, cnt);
    }

    ULL operator +(ULL v) {
        if (cnt < v.cnt)
            return *this;
        if (cnt > v.cnt)
            return v;
        return ULL(val + v.val, cnt);
    }
};

signed main() {
    ios_base::sync_with_stdio(0);

    /*int t;
    cin >> t;

    for (; t; t--) {
        string s;
        cin >> s;

        bool ch = true;
        for (char c : s)
            ch = ch && c != '?';

        if (ch) {
            if (s.size() == 2) {
                int m = 0;
                for (int i = 0; i < s.size(); i++) {
                    m *= 2;
                    if (s[i] == '1')
                        m++;
                }
                if (m == 0)
                    cout << "0?\n";
                else if (m == 1)
                    cout << "?1\n";
                else if (m == 2)
                    cout << "1?\n";
                else
                    cout << "??\n";
            }
        }
    }
    */
}
```

```

        continue;
    }

    int c0 = 0, c1 = 0;
    for (char c : s) {
        c0 += c == '0';
        c1 += c == '1';
    }
    if (c0 > c1) {
        for (char& c : s) {
            if (c == '0')
                c = '?';
        }
    }
    else if (c0 > 0) {
        for (char& c : s) {
            if (c == '1')
                c = '?';
        }
    }
    else {
        int n = s.size();
        mt19937 gen;
        gen.seed(n);
        vector<int> ord(n);
        for (int i = 0; i < n; i++)
            ord[i] = i;
        for (int i = 0; i < n; i++)
            swap(ord[i], ord[i + gen() % (n - i)]);
        for (int i = 0; i < (n - 1) / 2 + 1; i++)
            s[ord[i]] = '?';
    }
    cout << s << "\n";
}
else {
    if (s.size() == 2) {
        if (s == "0?")
            cout << "00\n";
        else if (s == "?1")
            cout << "01\n";
        else if (s == "1?")
            cout << "10\n";
        else
            cout << "11\n";
        continue;
    }

    int n = s.size();
    mt19937 gen;
    gen.seed(n);
    vector<int> ord(n);
    for (int i = 0; i < n; i++)
        ord[i] = i;
    for (int i = 0; i < n; i++)
        swap(ord[i], ord[i + gen() % (n - i)]);
    string fl(n, '1');
    for (int i = 0; i < (n - 1) / 2 + 1; i++)
        fl[ord[i]] = '?';
    if (fl == s) {
        for (int i = 0; i < n; i++)
            cout << "1";
        cout << "\n";
        continue;
    }

    int c0 = 0, c1 = 0;
    for (char c : s) {
        c0 += c == '0';
        c1 += c == '1';
    }

    if (c0 > 0) {
        for (int i = 0; i < n; i++) {
            if (s[i] == '?')

```



```

                                s[i] = '1';
                                }
                                }
                                else {
                                    for (int i = 0; i < n; i++) {
                                        if (s[i] == '?')
                                            s[i] = '0';
                                        }
                                    }
                                cout << s << "\n";
                            }
    }*/

    ll n;
    cin >> n;

    ULL a = 1, b = 2;
    for (ll i = 2; i <= n; i++) {
        ULL c = b + a * i * i;

        a = b;
        b = c;
    }

    cout << b.cnt << " " << b.val << "\n";

    return 0;
}
/*
4
0011100100010
1111010101111
0000000000000
1111111111111

4
??111??1???1?
???0?0?0????
?????????????
1?????1?1111
*/

```

Task E ()

```
#include <ctime>
#include <random>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

//const int MD = 998244353;
const int MD = 17, C = 547, MAX_V = 300000;

struct ULL {
    ll val, cnt;

    ULL(ll val, ll cnt = 0) {
        this->cnt = cnt;
        this->val = val;
        for (; this->val > 0 && this->val % MD == 0; this->val /= MD, this->cnt++) {}
        this->val %= MD;
    }

    ULL operator *(ll v) {
        return ULL(val * v, cnt);
    }

    ULL operator +(ULL v) {
        if (cnt < v.cnt)
            return *this;
        if (cnt > v.cnt)
            return v;
        return ULL(val + v.val, cnt);
    }
};

struct Request {
    int l, r, d, id;

    bool operator <(Request v) {
        return l / C < v.l / C || l / C == v.l / C && r < v.r;
    }
};

struct Fenwick {
    vector<int> sm;

    Fenwick(int n) {
        sm.resize(n + 1, 0);
    }

    void change(int x, int add) {
        for (int i = x + 1; i < sm.size(); i += i & -i)
            sm[i] += add;
    }

    int pref_sum(int x) {
        int res = 0;
        for (int i = x + 1; i > 0; i -= i & -i)
            res += sm[i];
        return res;
    }
};
```

```

signed main() {
    ios_base::sync_with_stdio(0);

    /* ll n = MD - 2;
    // cin >> n;

    ULL a = 1, b = 1;
    cout << "-1 " << a.cnt << " " << a.val << "\n";
    cout << "0 " << b.cnt << " " << b.val << "\n";
    for (ll i = 1; i <= n; i++) {
        ULL c = b + a * i * i;

        a = b;
        b = c;

        if ((i + 1) % MD == 0)
            cout << "\n";
        cout << i << " " << b.cnt << " " << b.val << "\n";
    }*/

    //cout << b.cnt << " " << b.val << "\n";

    mt19937 gen(1);

    int n = 50000;
    cin >> n;

    vector < int > v(n);
    for (int i = 0; i < n; i++) {
        cin >> v[i];
        //v[i] = gen() % MAX_V + 1;
    }

    int q = 50000;
    cin >> q;

    vector < Request > rq(q);
    for (int i = 0; i < q; i++) {
        cin >> rq[i].l >> rq[i].r >> rq[i].d;
        //rq[i].l = gen() % (n - 1);
        //rq[i].r = gen() % (n - rq[i].l) + rq[i].l + 1;
        //rq[i].d = gen() % (1000000) + 1;

        rq[i].r--;
        rq[i].d--;
        rq[i].id = i;
    }
    sort(all(rq));

    int l = 0, r = -1;
    Fenwick cnt(MAX_V + 1);
    vector < ll > res(q);
    for (Request cur : rq) {
        for (; l > cur.l; l--)
            cnt.change(v[l - 1], 1);
        for (; r < cur.r; r++)
            cnt.change(v[r + 1], 1);
        for (; l < cur.l; l++)
            cnt.change(v[l], -1);
        for (; r > cur.r; r--)
            cnt.change(v[r], -1);

        int ls = 0;
        res[cur.id] = r - l + 1;
        for (int c = 1; c <= cur.d; ) {
            int dlt = (cur.d % c) / (cur.d / c);
            int ns = cnt.pref_sum(min(c + dlt, MAX_V));

            res[cur.id] += (ll)(ns - ls) * (cur.d / c);

            ls = ns;
            c += dlt + 1;
        }
    }
}

```

```
        }  
    }  
    for (ll el : res)  
        cout << el << "\n";  
  
    //cout << (double)clock() / 1000 << '\n';  
  
    return 0;  
}
```

Task F ()

```
#include <ctime>
#include <random>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <vector>
#include <set>
#include <map>

#define all(a) a.begin(), a.end()

typedef long long ll;

using namespace std;

//const int MD = 998244353;
const int MD = 17, C = 547, MAX_V = 300000;

struct ULL {
    ll val, cnt;

    ULL(ll val, ll cnt = 0) {
        this->cnt = cnt;
        this->val = val;
        for (; this->val > 0 && this->val % MD == 0; this->val /= MD, this->cnt++) {}
        this->val %= MD;
    }

    ULL operator *(ll v) {
        return ULL(val * v, cnt);
    }

    ULL operator +(ULL v) {
        if (cnt < v.cnt)
            return *this;
        if (cnt > v.cnt)
            return v;
        return ULL(val + v.val, cnt);
    }
};

struct Request {
    int l, r, d, id;

    bool operator <(Request v) {
        return l / C < v.l / C || l / C == v.l / C && r < v.r;
    }
};

struct Fenwick {
    vector<int> sm;

    Fenwick(int n) {
        sm.resize(n + 1, 0);
    }

    void change(int x, int add) {
        for (int i = x + 1; i < sm.size(); i += i & -i)
            sm[i] += add;
    }

    int pref_sum(int x) {
        int res = 0;
        for (int i = x + 1; i > 0; i -= i & -i)
            res += sm[i];
        return res;
    }
};
```

```

signed main() {
    ios_base::sync_with_stdio(0);

    /*ll n = MD - 2;
    // cin >> n;

    ULL a = 1, b = 1;
    cout << "-1 " << a.cnt << " " << a.val << "\n";
    cout << "0 " << b.cnt << " " << b.val << "\n";
    for (ll i = 1; i <= n; i++) {
        ULL c = b + a * i * i;

        a = b;
        b = c;

        if ((i + 1) % MD == 0)
            cout << "\n";
        cout << i << " " << b.cnt << " " << b.val << "\n";
    }*/

    //cout << b.cnt << " " << b.val << "\n";

    /*mt19937 gen(1);

    int n = 50000;
    cin >> n;

    vector < int > v(n);
    for (int i = 0; i < n; i++) {
        cin >> v[i];
        //v[i] = gen() % MAX_V + 1;
    }

    int q = 50000;
    cin >> q;

    vector < Request > rq(q);
    for (int i = 0; i < q; i++) {
        cin >> rq[i].l >> rq[i].r >> rq[i].d;
        //rq[i].l = gen() % (n - 1);
        //rq[i].r = gen() % (n - rq[i].l) + rq[i].l + 1;
        //rq[i].d = gen() % (1000000) + 1;

        rq[i].r--;
        rq[i].d--;
        rq[i].id = i;
    }
    sort(all(rq));

    int l = 0, r = -1;
    Fenwick cnt(MAX_V + 1);
    vector < ll > res(q);
    for (Request cur : rq) {
        for (; l > cur.l; l--)
            cnt.change(v[l - 1], 1);
        for (; r < cur.r; r++)
            cnt.change(v[r + 1], 1);
        for (; l < cur.l; l++)
            cnt.change(v[l], -1);
        for (; r > cur.r; r--)
            cnt.change(v[r], -1);

        int ls = 0;
        res[cur.id] = r - l + 1;
        for (int c = 1; c <= cur.d; ) {
            int dlt = (cur.d % c) / (cur.d / c);
            int ns = cnt.pref_sum(min(c + dlt, MAX_V));

            res[cur.id] += (ll)(ns - ls) * (cur.d / c);

            ls = ns;
            c += dlt + 1;
        }
    }
}

```

```

    }
}

for (ll el : res)
    cout << el << "\n";

//cout << (double)clock() / 1000 << '\n';*/

int n;
cin >> n;

vector < int > l(n), r(n);
for (int i = 0; i < n; i++)
    cin >> l[i] >> r[i];

vector < int > dp(n + 1, 1);
for (int i = n - 1; i >= 0; i--) {
    ll cl = 0, cr = 0;
    for (int j = i + 1; j <= n; j++) {
        cl += l[j - 1];
        cr += r[j - 1];
        if (cl <= 0 && cr >= 0)
            dp[i] = max(dp[i], dp[j] + 1);
    }
}

int res = 0;
for (int i = 0; i <= n; i++)
    res = max(res, dp[i]);

cout << res << "\n";

return 0;
}

```