

Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	80	58	0	438

Task A ()

```
#include <bits/stdc++.h>

using namespace std;

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);

    int n;
    cin >> n;

    map<int, int> mp;
    for (int i = 0; i < n; i++) {
        int a, b;
        cin >> a >> b;
        int j = 0;
        while (a > 0) {
            int cur = a % 10; a /= 10;
            mp[b + j] += cur;
            j++;
        }

        int lastkey = -1;
        for (map<int, int>::iterator it = mp.begin(); it != mp.end(); it++) {
            int key = it->first, val = it->second;
            if (val >= 10) {
                mp[key + 1] += val / 10;
                it->second %= 10;
            }
            if (it->second != 0) {
                lastkey = key - 1;
                break;
            }
            //cout << it->first << " " << it->second << endl;
        }

        cout << lastkey + 1 << '\n';

        return 0;
    }
```

Task B ()

```
#include <bits/stdc++.h>

using namespace std;

int cnt(string &s) {
    int res = 0;
    for(int i=0; i<s.size(); i++) {
        if (s[i]=='e') res++;
    }
    return res / 2;
}

void wait_until(int need) {
    string s;
    cin>>s;
    int summ = cnt(s);
    while(summ<need) {
        cout<<"Wait"<<endl;
        cin>>s;
        int x = cnt(s);
        summ+=x;
    }
    return;
}

int main() {

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

    for(int i=n-1; i>=0; i--) {
        for(int j=0; j<a[i]; j++) {
            cout<<"Flip_and_wait"<<endl;
            wait_until(i+1);
        }
    }

    cout<<"Stop"<<endl;

    return 0;
}
```

Task C ()

```
#include<bits/stdc++.h>

using namespace std;

void solvegive(string s) {
    int cnt0 = 0, cnt1 = 0;
    for(int i=0; i<s.size(); i++) {
        if (s[i]=='0') cnt0++; else cnt1++;
    }
    if (cnt0==1) {
        int needost = 2;
        for(int i=0; i<s.size(); i++) {
            if (s[i]=='0') continue;
            if (needost>0) needost--; else {
                s[i] = '?';
            }
        }
        cout<<s<<endl;
        return;
    }
    if (cnt1==1) {
        int needost = 2;
        for(int i=0; i<s.size(); i++) {
            if (s[i]=='1') continue;
            if (needost>0) needost--; else {
                s[i] = '?';
            }
        }
        cout<<s<<endl;
        return;
    }
    if (cnt0==0 || cnt1==0) {
        for(int i=1; i<s.size(); i++) {
            s[i] = '?';
        }
        cout<<s<<endl;
        return;
    }
    if (cnt1 > cnt0) {
        for(int i=0; i<s.size(); i++) {
            if (s[i]=='1') s[i] = '?';
        }
        cout<<s<<endl;
        return;
    } else {
        for(int i=0; i<s.size(); i++) {
            if (s[i]=='0') s[i] = '?';
        }
        cout<<s<<endl;
        return;
    }
}

void solveask(string s) {
    int cnt0 = 0, cnt1 = 0, cnta = 0;
    for(int i=0; i<s.size(); i++) {
        if (s[i]=='0') cnt0++;
        if (s[i]=='1') cnt1++;
        if (s[i]=='?') cnta++;
    }
    if (cnt0==1 && cnt1==0) {
        for(int i=0; i<s.size(); i++) s[i] = '0';
        cout<<s<<endl; return;
    }
    if (cnt1==1 && cnt0==0) {
        for(int i=0; i<s.size(); i++) s[i] = '1';
        cout<<s<<endl; return;
    }
    if (cnt0==1 && cnt1==2) {
        for(int i=0; i<s.size(); i++) {
            if (s[i]=='?') s[i] = '1';
        }
    }
}
```

```

        cout<<s<<endl; return;
    }
    if (cnt0==2 && cnt1==1) {
        for(int i=0;i<s.size();i++) {
            if (s[i]=='?') s[i] = '0';
        }
        cout<<s<<endl; return;
    }
    if (cnt1==0) {
        for(int i=0;i<s.size();i++) {
            if (s[i]=='?') s[i] = '1';
        }
        cout<<s<<endl; return;
    }
    if (cnt0==0) {
        for(int i=0;i<s.size();i++) {
            if (s[i]=='?') s[i] = '0';
        }
        cout<<s<<endl; return;
    }
}

```

```

map<string,string> mp, bmp;
void solvegive2(string s) {
    cout<<mp[s]<<endl; return;
}

```

```

void solveask2(string s) {
    cout<<bmp[s]<<endl; return;
}

```

```

void calc() {
    mp["00"] = "0?"; bmp["0?"] = "00";
    mp["01"] = "?1"; bmp["?1"] = "01";
    mp["10"] = "?0"; bmp["?0"] = "10";
    mp["11"] = "1?"; bmp["1?"] = "11";

    mp["000"] = "0??"; bmp["0??"] = "000";
    mp["001"] = "00?"; bmp["00?"] = "001";
    mp["010"] = "0?0"; bmp["0?0"] = "010";
    mp["011"] = "?11"; bmp["?11"] = "011";
    mp["100"] = "?00"; bmp["?00"] = "100";
    mp["101"] = "1?1"; bmp["1?1"] = "101";
    mp["110"] = "11?"; bmp["11?"] = "110";
    mp["111"] = "1??"; bmp["1??"] = "111";

    mp["0000"] = "0???"; bmp["0???"] = "0000";
    mp["0001"] = "0??1"; bmp["0??1"] = "0001";
    mp["0010"] = "0?1?"; bmp["0?1?"] = "0010";
    mp["0011"] = "00??"; bmp["00??"] = "0011";
    mp["0100"] = "01??"; bmp["01??"] = "0100";
    mp["0101"] = "?1?1"; bmp["?1?1"] = "0101";
    mp["0110"] = "?11?"; bmp["?11?"] = "0110";
    mp["0111"] = "??11"; bmp["??11"] = "0111";
    mp["1000"] = "?0?0"; bmp["?0?0"] = "1000";
    mp["1001"] = "?00?"; bmp["?00?"] = "1001";
    mp["1010"] = "1?1?"; bmp["1?1?"] = "1010";
    mp["1011"] = "10??"; bmp["10??"] = "1011";
    mp["1100"] = "1?0?"; bmp["1?0?"] = "1100";
    mp["1101"] = "11??"; bmp["11??"] = "1101";
    mp["1110"] = "1??0"; bmp["1??0"] = "1110";
    mp["1111"] = "1???"; bmp["1???"] = "1111";
}

```

```

int main() {
    calc();

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

    int q;
}

```

```

cin>>q;
while(q--){
    string s; cin>>s;
    if (s.size()<=4){
        if (s.find("?")<s.size()) {
            solveask2(s);
        } else {
            solvegive2(s);
        }
    } else {
        if (s.find("?")<s.size()) {
            solveask(s);
        } else {
            solvegive(s);
        }
    }
}

return 0;
}

```

Task D ()

```
#include <bits/stdc++.h>

using namespace std;

const long long MOD = 998244353;

map<long long, long long> mp;
long long INF = 1e8;

long long vtupuu(long long n) {
    long long res = 1;
    for(long long i=2; i<=n; i++) {
        res = res*1ll*i%MOD;
    }
    return res;
}

long long fact(long long n) {
    map<long long, long long>::iterator it = mp.upper_bound(n);
    if (it==mp.begin()) return vtupuu(n);
    it--;
    long long res = (it)->second;
    for(long long i=it->first + 1; i<=n; i++) {
        res = res*1ll*i%MOD;
    }
    return res;
}

long long bin_pow(long long ch, long long st) {
    long long res = ch, cur = 1;
    while(cur <= st) {
        if (cur==st) return res;
        if (cur+cur<=st) {
            cur*=2;
            res = res*res%MOD;
        } else {
            cur++;
            res = res*ch%MOD;
        }
    }
}

void calc() {
    mp[INF] = 808258749;
    mp[2*INF] = 117153405;
    mp[3*INF] = 761699708;
    mp[4*INF] = 573994984;
    mp[5*INF] = 62402409;
    mp[6*INF] = 511621808;
    mp[7*INF] = 242726978;
    mp[8*INF] = 887890124;
    mp[9*INF] = 875880304;
}

int main() {
    calc();

    long long n;
    cin>>n;
    n++;

    long long cnt0 = n / MOD;
    long long ans = 1;
    if (cnt0!=0) {
        ans = ans*bin_pow(fact(MOD - 1), cnt0) % MOD;
    }
    if (n%MOD!=0) {
        ans = ans*fact(n%MOD)%MOD;
    }
    cout<<cnt0<<" " <<ans<<endl;
}
```

```
}    return 0;
```

Task E ()

```
#include <bits/stdc++.h>

using namespace std;

vector<int> a;

int bsz = 1000;
struct query{
    int l,r,d,idx;
};

bool cmp(query &a, query &b) {
    return a.r < b.r;
}
int L = 0, R = 0;
const int MAXC = 300005;
vector<int> fen(MAXC,0);

struct cntr{

    void Clear() {
        fen.assign(MAXC,0);
    }

    void Add(int pos,int val) {
        for(int i = pos; i<MAXC; i = i|(i+1)) {
            fen[i] += val;
        }
    }

    int sum(int pos) {
        int res = 0;
        for(int i = pos; i>=0; i = (i&(i+1)) - 1) {
            res += fen[i];
        }
        return res;
    }

    int Sum(int l,int r) {
        return sum(r) - sum(l-1);
    }
};

cntr counter;

int func(int m,int d) {
    return (d + m - 1) / m;
}

long long get(int d) {
    long long ans = 0;
    int l = 1, r = MAXC;

    while(r - 1 > 1) {
        int lold = l;
        int need = func(l,d);
        while(r - 1 > 1) {
            int m = (r + 1) / 2;
            if (func(m,d) == need) l = m; else r = m;
        }
        int curent = counter.Sum(lold,l);
        ans += func(l,d)*1ll*curent;
        l++;
        r = MAXC;
    }

    return ans;
}

int main() {
    ios_base::sync_with_stdio(false);
```



```

cin.tie(0);
cout.tie(0);

int n;
cin>>n;
a.resize(n);
for(int i=0;i<n;i++) cin>>a[i];
int q; cin>>q;
vector<query> blocks[310];
for(int i=0;i<q;i++) {
    int a,b,d;
    cin>>a>>b>>d;
    blocks[a/bsz].push_back({a,b,d,i});
}

vector<long long> ans(q);
for(int i=0;i<310;i++) {
    sort(blocks[i].begin(),blocks[i].end(),cmp);
    counter.Clear();
    L = bsz*i, R = bsz*i;
    for(int j=0;j<blocks[i].size();j++) {
        int l = blocks[i][j].l, r = blocks[i][j].r;
        while(L>l) {
            counter.Add(a[L-1],1); L--;
        }
        while(R<r) {
            counter.Add(a[R],1); R++;
        }
        while(L<l) {
            counter.Add(a[L],-1); L++;
        }
        while(R>r) {
            counter.Add(a[R-1],-1); R--;
        }
        ans[blocks[i][j].idx] = get(counter,d);
    }
}

for(int i=0;i<q;i++) {
    cout<<ans[i]<<'\n';
}

return 0;
}

```

Task F ()