Олимпиада СПбГУ по информатике 2021/22 учебного года

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

Task A ()

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

using namespace std;
#define int long long
#define double long double
#define endl "\n"
#define null NULL
#define pii pair<int, int>

const int inf = 1e18;

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(), cout.tie();

    bool local = getenv("local");
    if (local) {
        freopen("../files/input.txt", "r", stdin);
        freopen("../files/output.txt", "w", stdout);
    }

    int n;
    cin >> n;
    map<int, int> sum;
    for (int i = 0; i < n; ++i) {
        int a, b, a1, b1;
        cin >> a >> b;
        a1 = a, b1 = b;
        while (a >= 1) {
            if (a % 10)
                sum[b] += a % 10;
            a /= 10;
            b++;
        }
        while (a1 >= 1 || sum[b1] >= 10) {
            if (sum[b1] >= 10) {
                sum[b1 + 1] += sum[b1] / 10;
                sum[b1] %= 10;
            }
            a1 /= 10;
            b1++;
        }
    }

    int ans = inf;
    for (auto entry: sum) {
        if (entry.second == 0) continue;
        ans = min(ans, entry.first);
    }
    cout << ans << endl;
}
```

Task B ()

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

using namespace std;
#define int long long
#define double long double
//#define endl "\n"
#define null NULL
#define pii pair<int, int>

const int inf = 1e18;

int get_cnt(const string &a) {
    int cnt = 0;
    for (auto chr: a)
        if (chr == 'e')
            cnt++;
    return cnt / 2;
}

inline void solve() {
    int n;
    cin >> n;
    vector<int> k(n), eq(n, 0);
    for (int i = 0; i < n; ++i)
        cin >> k[i];
    int i = n - 1;
    while (i >= 0 && k[i] <= 0) i--;
    if (i >= 0) {
        cout << "Flip and wait" << endl;
    }
    int wait = i + 1;
    while (i >= 0) {
        string beep;
        cin >> beep;
        int cnt = get_cnt(beep);
        wait -= cnt;
        if (wait > 0) {
            cout << "Wait" << endl;
            continue;
        }
        k[i]--;
        while (i >= 0 && k[i] <= 0) i--;
        wait = i + 1;
        if (i >= 0)
            cout << "Flip and wait" << endl;
    }
    cout << "Stop" << endl;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(), cout.tie();

//    bool local = getenv("local");
//    if (local) {
//        freopen("../files/input.txt", "r", stdin);
//        freopen("../files/output.txt", "w", stdout);
//    }

    solve();
}
```

Task C ()

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

using namespace std;
#define int long long
#define double long double
#define endl "\n"
#define null NULL
#define pii pair<int, int>

const int inf = 1e18;

bool is_generating(const string &a) {
    bool res = true;
    for (char chr: a)
        res &= chr != '?';
    return res;
}

string generate_str(const string &a) {
    int cnt[2] = {0, 0};
    for (char chr: a)
        cnt[chr == '1']++;
    string res;
    char replace = '0';
    int cnt_q = cnt[0] / 2 * 2;
    if (cnt[1] >= cnt[0] && cnt[1] % 2 == 1)
        replace = '1', cnt_q = cnt[1];
    if (cnt[1] - 1 >= cnt[0] && cnt[1] % 2 == 0)
        replace = '1', cnt_q = cnt[1] - 1;
    for (char chr: a) {
        if (chr == replace && cnt_q > 0)
            res += '?', cnt_q--;
        else
            res += chr;
    }
    return res;
}

string get_str(const string &a) {
    int cnt_q = 0;
    for (char chr: a) {
        if (chr == '?')
            cnt_q++;
    }
    char d = (char) ((int) '0' + cnt_q % 2);
    string res;
    for (char chr: a) {
        if (chr == '?')
            res += d;
        else
            res += chr;
    }
    return res;
}

inline void solve() {
    int n;
    cin >> n;
    for (int i = 0; i < n; ++i) {
        string str;
        cin >> str;
        bool gen = is_generating(str);
        if (gen)
            cout << generate_str(str) << endl;
        else
            cout << get_str(str) << endl;
    }
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(), cout.tie();
```

```
    bool local = getenv("local");
    if (local) {
        freopen("../files/input.txt", "r", stdin);
        freopen("../files/output.txt", "w", stdout);
    }

    solve();
}
```

Task D ()

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

#pragma GCC optimize("fast-math", "-O3", "O3")

using namespace std;
#define int unsigned long long
#define double long double
#define endl "\n"
#define null NULL
#define pii pair<int, int>
#define veci vector<int>

const int inf = 1e18;
const int mod = 998244353;
vector<int> facts = {1, 945896249, 826994544, 147972654, 718271290, 311054462, 848172652,
    487479281, 181218541,
                     225032295, 464016596, 303879624, 711595889, 801978400, 274311861, 262505243,
                         197661226,
                     560969645, 59654808, 844084429, 63299249, 656698209, 745706197, 782663844,
                         722450722,
                     437503635, 974490943, 756414660, 100919583, 567153381, 434731971, 992060846,
                         397327632,
                     588176542, 152285902, 561146832, 410851918, 739984378, 631617451, 918814530,
                         55395755,
                     984167498, 880949811, 904643816, 713793642, 44666331, 712775427, 443688906,
                         488198727,
                     374504494, 15814281, 809754637, 581403016, 931134979, 415434801, 733417940,
                         522329741,
                     396654552, 691138193, 924037483, 565294571, 647279052, 93888746, 491863506,
                         860288574,
                     933267285, 420593226, 601485588, 643768503, 139726730, 293833759, 963402916,
                         983736712,
                     496456348, 270369543, 205793557, 946545391, 54554286, 827540230, 533325452,
                         851627080,
                     695240733, 872441336, 641905269, 107293455, 814887934, 659546511, 435069442,
                         36312125,
                     691840784, 130777589, 586041601, 696055209, 627965301, 914253051, 159075500,
                         818001905,
                     839514995, 613224734, 923597279};

int bin_pow(int a, int n) {
    int p2 = a;
    int res = 1;
    while (n > 0) {
        if (n % 2)
            res = (res * p2) % mod;
        p2 = (p2 * p2) % mod;
        n /= 2;
    }
    return res;
}


int to_(int a, int n = mod) {
    while (a > 0) {
        if (a % n != 0)
            return a % n;
        a /= n;
    }
    return 0;
}

inline int fact(int a, int b, bool use_mod = true) {
    int res = 1;
    a = max(a, 1ull);
    while (b >= a) {
        res = (res * a++);
        if (use_mod)
            res %= mod;
    }
    return res;
}
```

```
inline int fast_fact(int a) {
    return (facts[a / 10000000] * fact(a / 10000000 * 10000000, a)) % mod;
}

inline string fact(int n) {
    int cnt = n / mod;
    int cnt1 = cnt;
    if (n >= mod * mod) {
        cnt++;
    }
    int n1 = n;
    n %= mod;
    int prev = fact(mod / 10000000 * 10000000, mod - 1);
    int ans = (bin_pow(prev, cnt1) * fast_fact(n)) % mod;
    for (int i = mod; i <= n1; i += mod) {
        if (i % (mod * mod) == 0) continue;
        ans = (ans * (i / mod)) % mod;
    }
    return to_string(cnt) + "␣" + to_string(ans);
}

inline void solve(int test) {
    int n;
    n = test;
    cin >> n;
    cout << fact(n + 1) << endl;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(), cout.tie();

    int t = 1;
    bool local = getenv("local");
    if (local) {
        freopen("../files/input.txt", "r", stdin);
        freopen("../files/output.txt", "w", stdout);
        cin >> t;
    }
    int test = 1;
    while (t--)
        solve(test++);
}
```

Task E ()

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

#pragma GCC optimize("fast-math", "-O3", "O3")

using namespace std;
#define int long long
#define double long double
#define endl "\n"
#define null NULL
#define pii pair<int, int>
#define veci vector<int>

const int inf = 1e18;

vector<int> v;

inline int calc(int a, int b, int d) {
    int cost = 0;
    for (int i = a; i < b; ++i)
        cost += (d + v[i] - 1) / v[i];
    return cost;
}

inline void solve(int test) {
    int n, q;
    cin >> n;
    v.resize(n);
    for (int i = 0; i < n; ++i)
        cin >> v[i];
    cin >> q;
    for (int i = 0; i < q; ++i) {
        int a, b, d;
        cin >> a >> b >> d;
        cout << calc(a, b, d) << endl;
    }
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(), cout.tie();

    int t = 1;
    bool local = getenv("local");
    if (local) {
        freopen("../files/input.txt", "r", stdin);
        freopen("../files/output.txt", "w", stdout);
//        cin >> t;
    }
    int test = 1;
    while (t--)
        solve(test++);
}
```

Task F ()