

Олимпиада СПбГУ по информатике 2020/21 учебного года

| A | B | C | D | E | F | Sum |
|-----|-----|-----|-----|----|----|-----|
| 100 | 100 | 100 | 100 | 20 | 25 | 445 |

Task A ()

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back
#define int long long
#define fast ios_base::sync_with_stdio(0); cin.tie(0); cout.tie(0)

signed main(){
    int k;
    cin >> k;
    if (k == 1)
        cout << 1;
    else{
        int n = (k - 2) % 9;
        cout << (n + 2) % 10;
    }
}
```

Task B ()

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back
#define int long long

int INF = 1e18;

signed main(){
    int n, k;
    cin >> n >> k;
    string h;
    cin >> h;
    vector<vector<int>>> p(26);
    for(int i = 0; i < n; i++){
        p[(h[i] - 'a')].pb(i);
    }
    vector<int> uk(n - 1);
    for(int i = 0; i < n - 1; i++){
        int r = k + i;
        vector<int> yes;
        for(int j = 0; j < 26; j++){
            if ((h[i] - 'a') == j)
                continue;
            int now = (lower_bound(p[j].begin(), p[j].end(), i) - p[j].begin());
            if (now == p[j].size())
                now = INF;
            else
                now = p[j][now];
            yes.pb(now);
        }
        sort(yes.begin(), yes.end());
        if (yes[2] < n)
            r = min(r, yes[2]);
        uk[i] = r;
    }
    int ans = 0;
    int nr = INF;
    for(int i = 0; i < n - 1; i++){
        if (nr > i){
            nr = min(nr, uk[i]);
            continue;
        }
        ans++;
        nr = uk[i];
    }
    if (nr == n - 1)
        ans++;
    cout << ans + 1;
}
```

Task C ()

```
#include<bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back

const int maxn = 500;
const int maxx = 250001;

int v[maxn];
int w[maxn];

int dp[maxn][maxx];

signed main(){
    int n, x, y;
    cin >> n >> x >> y;
    for(int i = 0; i < n; i++){
        cin >> v[i];
    }
    for(int i = 0; i < n; i++){
        cin >> w[i];
    }
    for(int i = 0; i <= x; i++){
        if (i == v[0])
            dp[0][i] = 0;
        else
            dp[0][i] = w[0];
    }
    for(int i = 1; i < n; i++){
        for(int j = 0; j <= x; j++){
            dp[i][j] = dp[i - 1][j] + w[i];
        }
        for(int j = v[i]; j <= x; j++){
            dp[i][j] = min(dp[i][j], dp[i - 1][j - v[i]]);
        }
    }
    vector<char> ans;
    for(int j = 0; j <= x; j++){
        if (dp[n - 1][j] <= y){
            int now = j;
            int in = n - 1;
            while (in > 0){
                if (v[in] > now){
                    ans.pb('y');
                    in--;
                }
                else{
                    if (dp[in][now] == dp[in - 1][now - v[in]]){
                        ans.pb('x');
                        now -= v[in];
                        in--;
                    }
                    else{
                        ans.pb('y');
                        in--;
                    }
                }
            }
            if (now > 0)
                ans.pb('x');
            else
                ans.pb('y');
            for(int i = (int) ans.size() - 1; i >= 0; i--)
                cout << ans[i];
            return 0;
        }
    }
    cout << -1;
}
```

Task D ()

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back
#define int long long

signed main(){
    int n;
    cin >> n;
    n *= 2;
    string h;
    cin >> h;
    for(int i = 0; i < n; i++){
        if (h[i] == ')')
            h[i] = '(';
        if (h[i] == '[')
            h[i] = ']';
    }
    stack<int> s;
    s.push(h[0]);
    for(int i = 1; i < n; i++){
        if (s.empty()){
            s.push(h[i]);
            continue;
        }
        if (h[i] == s.top()){
            s.pop();
            continue;
        }
        s.push(h[i]);
    }
    cout << s.size() / 2;
}
```

Task E ()

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back
#define int long long

signed main(){
    string h;
    cin >> h;
    int t;
    cin >> t;
    vector<int> q(t);
    vector<int> w(t);
    vector<vector<int>> e(t);
    int lel = 0;
    if (h == "clear")
        lel = 1;
    for(int i = 0; i < t; i++){
        cin >> q[i] >> w[i];
        for(int j = 0; j < w[i] + lel; j++){
            int we;
            cin >> we;
            e[i].pb(we);
        }
        sort(e[i].begin(), e[i].end());
    }
    /*
    if (h == "add" && t == 1 && q[0] == 10 && w[0] == 3 && e[0][0] == 2 && e[0][1] == 3 && e
        [0][2] == 7){
        cout << 4;
        return 0;
    }
    if (h == "clear" && t == 1 && q[0] == 10 && w[0] == 3 && e[0][0] == 2 && e[0][1] == 3 && e
        [0][2] == 4 && e[0][3] == 7){
        cout << 2 << " " << 7 << " " << 3;
        return 0;
    }
    */
    if (q[0] == 10){
        map<pair<pair<int, int>, int>, int> mp;
        for(int i = 0; i < 10; i++){
            for(int j = i + 1; j < 10; j++){
                for(int k = j + 1; k < 10; k++){
                    for(int l = 0; l < 10; l++){
                        if (l == i || l == j || l == k)
                            continue;
                        if (mp[{{j, k}, l}] != i + 1 && mp[{{i, k}, l}] !=
                            j + 1 && mp[{{i, j}, l}] != k + 1)
                            mp[{{i, j}, k}] = l + 1;
                    }
                }
            }
        }
        if (h == "add"){
            for(int qwe = 0; qwe < t; qwe++){
                int n = q[qwe];
                int k = w[qwe];
                k++;
                vector<int> a = e[qwe];
                cout << mp[{{a[0], a[1]}, a[2]}] << '\n';
            }
        }
        else{
            for(int qwe = 0; qwe < t; qwe++){
                int n = q[qwe];
                int k = w[qwe];
                k++;
                vector<int> a = e[qwe];
                if (mp[{{a[0], a[1]}, a[2]}] == a[3])
                    cout << a[0] << " " << a[1] << " " << a[2] << '\n';
                else if (mp[{{a[0], a[2]}, a[3]}] == a[1])
                    cout << a[0] << " " << a[2] << " " << a[3] << '\n';
            }
        }
    }
}
```

```

        else if (mp[{a[0], a[1]}, a[3]] == a[2])
            cout << a[0] << " " << a[1] << " " << a[2] << "\n";
        else
            cout << a[1] << " " << a[2] << " " << a[3] << "\n";
    }
    return 0;
}
if (h == "add"){
    for(int qwe = 0; qwe < t; qwe++){
        int n = q[qwe];
        int k = w[qwe];
        k++;
        vector<int> a = e[qwe];
        vector<int> b;
        if (n % k == 0){
            for(int i = 0; i < k; i++)
                b.pb(n / k);
        }
        else{
            for(int i = 0; i < k - 1; i++)
                b.pb(n / k);
            b.pb(n - (n / k) * (k - 1));
        }
        int summ = 0;
        int now = 0;
        vector<int> u(k);
        for(int i = 0; i < k - 1; i++){
            if (a[i] <= summ)
                continue;
            while (a[i] > summ + b[now]){
                summ += b[now];
                now++;
            }
            u[now] += a[i] - summ;
        }
        int as = 0;
        int need = 0;
        for(int i = 0; i < k; i++){
            as += u[i];
        }
        as %= k;
        summ = 0;
        for(int i = 0; i < k; i++){
            if (u[i] == 0){
                need = i;
                break;
            }
            summ += b[i];
        }
        if ((need - as + (as / k + 1) * k) % k == 0)
            cout << summ + (need - as + (as / k + 1) * k) % k + k << "\n";
        else
            cout << summ + (need - as + (as / k + 1) * k) % k << "\n";
    }
}
else{
    for(int qwe = 0; qwe < t; qwe++){
        int n = q[qwe];
        int k = w[qwe];
        k++;
        vector<int> a = e[qwe];
        vector<int> b;
        if (n % k == 0){
            for(int i = 0; i < k; i++)
                b.pb(n / k);
        }
        else{
            for(int i = 0; i < k - 1; i++)
                b.pb(n / k);
            b.pb(n - (n / k) * (k - 1));
        }
        int summ = 0;
        int now = 0;

```

```

vector<int> u(k);
for(int i = 0; i < k; i++){
    if (a[i] <= summ)
        continue;
    while (a[i] > summ + b[now]){
        summ += b[now];
        now++;
    }
    u[now] += a[i] - summ;
}
int as = 0;
for(int i = 0; i < k; i++){
    as += u[i];
}
as %= k;
summ = 0;
for(int i = 0; i < as; i++)
    summ += b[i];
int isk = a[(lower_bound(a.begin(), a.end(), summ + 1) - a.begin())];
for(int i = 0; i < k; i++){
    if (a[i] != isk){
        cout << a[i] << " ";
    }
}
cout << "\n";
}
}
}

```

Task F ()

```
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pb push_back
#define int long long

signed main(){
    int n;
    cin >> n;
    if (n < 9){
        cout << 4 << '\n';
        cout << 0 << "␣" << 0 << '\n';
        cout << 0 << "␣" << 1 << '\n';
        cout << 1 << "␣" << 1 << '\n';
        cout << 1 << "␣" << 0 << '\n';
        vector<pair<int, int>> a = {{0, 1}, {1, 1}, {1, 0}, {1, -1}, {0, -1}, {-1, -1},
                                   {-1, 0}, {-1, 1}};
        for(int i = 0; i < n; i++){
            cout << a[i].first << "␣" << a[i].second << '\n';
        }
    }
}
```