

Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	55	25	480

Task A ()

```
#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll>(c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << '\n'
#define pb push_back
#define vll vector<ll>
// #define int ll

signed main() {
    // while(true) {
        int k;
        cin >> k;
        ll sum = 0;
        int i = 1;
        bool p = true;
        while (k--) {
            sum += i;
            // if (i == 10) p = false;
            // if (p) i++; else i--;
            i++;
            if (k == 0) break;
            sum /= 10;
        }
        cout << sum % 10 << e;
    // }
}
```

```

/*
121
12321
1234321
123454321
12345654321    6
1234567654321
123456787654321
12345678987654321
1234567900987654321 10
123456790120987654321
12345679012320987654321
1234567901234320987654321
123456790123454320987654321
12345679012345654320987654321
1234567901234567654320987654321

*/

```

Task B ()

```
#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll>(c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << '\n'
#define pb push_back
#define vll vector<ll>
// #define int ll

signed main() {
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    int kl1 = 0;
    unordered_set<char> a;
    ll ans = 0;
    fo(i, 0, s.length()) {
        kl1++;
        a.insert(s[i]);
        if (a.size() > 3) {
            ans++;
            kl1 = 1;
            a.clear();
            a.insert(s[i]);
        }
        if (kl1 > k) {
            ans++;
            kl1 = 1;
            a.clear();
            a.insert(s[i]);
        }
    }
    if (kl1 != 0) ans++;
    cout << ans;
}

/*
3 3
abc

3 2
aaa
```

5 5
abacd

4 4
abcb

*/

Task C ()

```
#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll>(c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << '\n'
#define pb push_back
#define vll vector<ll>
// #define int ll

signed main() {
    int n, X, Y;
    cin >> n >> X >> Y;
    vector<tuple<int, int, int>> a(n);
    fo(i, 0, n){
        int q;
        cin >> q;
        a[i] = {q, 0, 0};
        // cin >> a[i + 1].first;
    }
    ll sum = 0;
    fo(i, 0, n){
        int q;
        cin >> q;
        sum += q;
        a[i] = {get<0>(a[i]), q, i + 1};
    }
    sort(all(a));
    vector<int> dp(X + 5, -1);
    dp[0] = 0;
    vector<vector<bool>> dp2(X + 5, vector<bool>(n + 1, false));
    fo(i, 0, n){
        auto [x2, y2, ind] = a[i];
        int x = x2, y = y2;
        for(int j = X; j >= 0; j--){
            if (x + j <= X && dp[j] + y > dp[j + x] && dp[j] != -1){
                dp[j + x] = dp[j] + y;
                dp2[j + x] = dp2[j];
                dp2[j + x][ind] = true;
            }
        }
    }
    fo(i, 0, X + 1){
        if (sum - dp[i] <= Y && dp[i] != -1){
            fo(j, 1, n + 1){
```

```

        if (dp2[i][j]) cout << 'x'; else cout << 'y';
    }
    return 0;
}
cout << -1;
}

/*

5 10 12
1 4 3 5 10
8 8 5 9 6

5 10 12
1 4 4 5 10
8 8 8 9 6
*/

```

Task D ()

```

#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll> (c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << '\n'
#define pb push_back
#define vll vector<ll>
// #define int ll

signed main() {
    int n;
    cin >> n;
    n *= 2;
    string s;
    cin >> s;
    map<int, int> a;
    fo(i, 0, n) {
        if (s[i] == '(' || s[i] == ')') a[i] = 0; else
            a[i] = 1;
    }
    auto it = a.begin();
    ll ans = 0;
    while (!a.empty()) {
        if (it == a.end()) break;
        auto it2 = it;
        it2++;
        if (it2 == a.end()) break;
        if (it->second == it2->second) {
            a.erase(it);
            it = it2;
            it++;
            a.erase(it2);
            // it = it2;
            if (it != a.begin())
                it--;
        } else it++;
    }
    cout << a.size() / 2;
}

/*
1
([

```

1
((

1
)

2
[(1)

5
[(((([([([
*/

Task E ()

```
#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll>(c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << endl
#define pb push_back
#define vll vector<ll>
// #define int ll
int a[11][11][11];
bool prov(int a1, int a2, int a3, int a4){
    vll b = {a1, a2, a3, a4};
    sort(all(b));
    a1 = b[0]; a2 = b[1], a3 = b[2], a4 = b[3];
    if (a[a1][a2][a3] == a4 || a[a1][a2][a4] == a3 || a[a1][a3][a4] == a2 ||
        a[a2][a3][a4] == a1) return false;
    return true;
}
// vector<tuple<int, int, int>

ll func(vll &b){
    vector<bool> used(1e5 + 1, false);
    for(auto i : b){
        if (i == -1) continue;
        used[i] = true;
    }
    int kl = 0;
    fo(i, 1, 1e5 + 1){
        if (!used[i]) kl++;
        if (kl == 50) return i;
    }
    exit(1);
}

signed main() {
    fo(i, 0, 11){
        fo(j, 0, 11){
            fo(k, 0, 11){
                a[i][j][k] = 0;
            }
        }
    }
    fo(i, 1, 11){
        fo(j, i + 1, 11){
            fo(k, j + 1, 11){
                for(int ne = 10; ne >= 1; ne--){
```

```

        if (prov(i, j, k, ne) && i != ne && j != ne && k != ne) a[i][j][k] = ne;
    }
}
}
random_device rd;
mt19937 gen(rd());
//fo(i,)
string s;
cin >> s;
if (s == "add"){
    int t;
    cin >> t;
    while(t--){
        int n, k;
        cin >> n >> k;
        ve(b,k,0);
        fo(i,0,k) cin >> b[i];
        sort(all(b));
        if (n == 10) cout << a[b[0]][b[1]][b[2]] e;
        if (n == 1e6){
            cout << 151870 e;
        }
        if (n == 1e5){
            //100000
            // 84160
            // 590
            // 77177
            if (find(all(b), 84160) == b.end() && find(all(b), 590) == b.end()) cout << 84160
                e; else
                cout << 590 e;
        }
    }
} else {
    int t;
    cin >> t;
    while(t--){
        int n, k;
        cin >> n >> k;
        ve(b,k + 1, 0);
        fo(i,0,k + 1) cin >> b[i];
        sort(all(b));
        //b[0] ==> a[b[1]][b[2]][b[3]] == b[0]
        if (n == 10) {
            int per;
            if (a[b[1]][b[2]][b[3]] == b[0]) per = b[0];
            if (a[b[0]][b[2]][b[3]] == b[1]) per = b[1];
            if (a[b[0]][b[1]][b[3]] == b[2]) per = b[2];
            if (a[b[0]][b[1]][b[2]] == b[3]) per = b[3];
            fo(i, 0, k + 1) {
                if (b[i] == per) continue;
                cout << b[i] << '└';
            }
            cout e;
        }
        if (n == 1e6){
            fo(i,0,k + 1){
                if (b[i] == 151870) continue;
                cout << b[i] << '└';
            }
            cout e;
        }
        if (n == 1e5){
            int per;
            if (find(all(b), 590) != b.end() && find(all(b), 84160) != b.end()) per = 590;
            else
                per = 84160;
            fo(i,0,k + 1){
                if (b[i] == per) continue;
                cout << b[i] << '└';
            }
            cout e;
        }
    }
}
}

```

```

    }

}

/*
A = 100
B = 100
C = 100
D = 100
E = 55
F = 25

480/600

add
1
10 3
7 2 3

clear
1
10 3
2 7 3 4

add
5
30 10sdds
1 3 6 9 14 15 2 7 30 29

*/

```

Task F ()

```
#include <iostream>
#include <string>
#include <cmath>
#include <vector>
#include <iomanip>
#include <fstream>
#include <queue>
#include <deque>
#include <set>
#include <map>
#include <list>
#include <functional>
#include <unordered_set>
#include <unordered_map>
#include <cstdio>
#include <bitset>
#include <ctime>
#include <random>
#include <algorithm>
#include <bitset>
#include <random>
// #include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ve(a,b,c) vector<ll> a(b,c);
#define fo(a,b,c) for (ll a = b; a < c; a++)
#define vec(a,b,c,d) vector<vector<ll>> a(b, vector<ll>(c,d));
#define vect vector<vector<ll>>
#define all(a) a.begin(), a.end()
#define rd round
#define cl ceil
#define ios ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);
#define e << endl
#define pb push_back
#define vll vector<ll>
// #define int ll

signed main() {
    int n;
    cin >> n;
    if (n <= 4){
        cout << 4 e;
        cout << "-1_1\n"
                 "-1_1\n"
                 "1_1\n"
                 "1_-1\n";
        if (n == 1){
            cout << "1_2\n";
        }
        if (n == 2){
            cout << "1_2\n";
            cout << "-2_1\n";
        }
        if (n == 3){
            cout << "1_2\n";
            cout << "-2_1\n";
            cout << "1_-2\n";
        }
        if (n == 4){
            cout << "1_2\n";
            cout << "-2_1\n";
            cout << "2_-1\n";
            cout << "-1_-2\n";
        }
        return 0;
    }
    cout << 4 e;
    cout << "-1_1\n"
            "-1_1\n"
            "1_1\n"
            "1_-1\n";
    vll x = {-2, 0, 2, 2, 2, 0, -2, -2, 0};
```

```

    vll y = {2, 2, 2, 0, -2, -2, -2, 0, 0};
    fo(i,0,n){
        cout << x[i] << ' ' << y[i] << " ";
    }

```

```

}

```

```

/*
-1 -1
-1 1
1 1
1 -1
*/

```