Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	58	31	489

Task A ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <algorithm>
#include <vector>

using namespace std;

#define int long long

typedef long long ll;
typedef pair<int, int> pii;

const int N = 1e7;

int a[N];
int b[N];
int sum[N];

signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif
        ios_base::sync_with_stdio(0);
        cin.tie(0);
        int n;
        cin >> n;
        int minb = 3e9;
        for (int i = 0; i < n; i++)
        {
                cin >> a[i] >> b[i];
                minb = min(minb, b[i]);
        }
        for (int i = 0; i < n; i++)
        {
                for (int j = b[i] - minb; ((a[i] > 0) && (j < N)); j++)
                {
                        sum[j] += a[i] % 10;
                        a[i] /= 10;
                }
        }
        int cnt = 0;
        for (int j = 0; j < N; j++)
        {
                sum[j + 1] += sum[j] / 10;
                sum[j] %= 10;
                if (sum[j] == 0)
                {
                        cnt++;
                }
                else
                {
                        break;
                }
```

```
        }
        cout<< cnt + minb;
}
```

Task B ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <algorithm>
#include <vector>

using namespace std;

#define int long long

typedef long long ll;
typedef pair<int, int> pii;

const int N = 150;

int k[N];

signed main()
{
#ifdef _DEBUG
    //freopen("input.txt", "r", stdin);
#endif
    //ios_base::sync_with_stdio(0);
    //cin.tie(0);
    int n;
    cin >> n;
    for (int i = 0; i < n; i++)
    {
        cin >> k[i];
    }
    for (int i = n - 1; i >= 0; i--)
    {
        for (int j = 0; j < k[i]; j++)
        {
            int pos = 0;
            cout << "Flip_and_wait" << endl;
            int cnt = 1;
            while (true)
            {
                string str;
                cin >> str;
                pos += (str.size() - 3) / 2;
                if (pos > i)
                {
                    break;
                }
                else
                {
                    cout << "Wait" << endl;
                }
            }
        }
    }
    cout << "Stop" << endl;
}
```

Task C ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <algorithm>
#include <vector>
#include <random>

using namespace std;

#define int long long
#define endl '\n'

typedef long long ll;
typedef pair<int, int> pii;

const int N = 150;

mt19937 rnd(38474);

signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif
        ios_base::sync_with_stdio(0);
        cin.tie(0);
        int t;
        cin >> t;
        while (t--)
        {
                string str;
                cin >> str;
                int sz = str.size() - str.size() % 2;
                int cnt[2] = { 0,0 };
                int fl = 0;
                for (int i = 0;i<sz;i++)
                {
                        if (str[i] == '?')
                        {
                                fl++;
                        }
                        else
                        {
                                cnt[str[i] - '0']++;
                        }
                }
                if (fl)
                {
                        int S;
                        if (cnt[0] == sz / 2)
                        {
                                S = 0;
                        }
                        else
                        {
                                if (cnt[1])
                                {
                                        S = 0;
                                }
                                else
                                {
                                        S = 1;
                                }
                        }
                        for (int i = 0; i < sz; i++)
                        {
                                if (str[i] == '?')
                                {
                                        str[i] = S + '0';
                                }
                        }
                }
```

```cpp
			}
			else
			{
				if (cnt[0] == sz)
				{
					for (int i = 0; i < sz / 2; i++)
					{
						str[i] = '?';
					}
				}
				else
				{
					int S;
					if (cnt[0] >= cnt[1])
					{
						S = 0;
					}
					else
					{
						S = 1;
					}
					for (int i = 0; i < sz; i++)
					{
						if (str[i] == S + '0')
						{
							str[i] = '?';
						}
					}
				}
			}
			cout<< str << endl;
		}
}
```

Task D ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#pragma GCC optimize("Ofast")
#pragma GCC target("avx2")

#include <iostream>
#include <fstream>
#include <assert.h>

using namespace std;

const long long mod = 998244353;

long long powp(long long a, int b)
{
        long long ans = 1;
        long long now = a;
        while (b)
        {
                if (b & 1)
                {
                        ans *= now;
                        ans %= mod;
                }
                now *= now;
                now %= mod;
                b >>= 1;
        }
        return ans;
}

signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif
        long long n;
        cin >> n;
        n++;
        bool fl = false;
        long long s = 0;
        s += n / mod;
        if (s % 2 == 1)
                fl = true;
        s += n / (mod * mod);
        n %= mod;
        long long ans = 0;
        if (n == 0)
        {
                ans = 1;
        }
        else if (n <= mod / 2)
        {
                long long f = 1;
                for (int i = 2; i <= n; i++)
                {
                        f *= i;
                        f %= mod;
                }
                ans = f;
        }
        else
        {
                long long f = 1;
                for (int i = n + 1; i < mod; i++)
                {
                        f *= i;
                        f %= mod;
                }
                f = mod - f;
                ans = powp(f, mod - 2) % mod;
        }
```

```cpp
        cout<< s << " "<< (fl ? mod - ans : ans);
}
```

Task E ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#pragma GCC optimize("Ofast")
#pragma GCC target("avx2")

#include <iostream>
#include <fstream>
#include <algorithm>
#include <vector>
#include <random>

using namespace std;

#define endl '\n'

typedef long long ll;
typedef pair<int, int> pii;

const int N = 5e5;

int v[N];

signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif
        ios_base::sync_with_stdio(0);
        cin.tie(0);
        int n;
        cin >> n;
        for (int i = 0; i < n; i++)
        {
                cin >> v[i];
        }
        int q;
        cin >> q;
        while (q--)
        {
                int l, r, k;
                cin >> l >> r >> k;
                int ans = 0;
                for (int i = l; i < r; i++)
                {
                        ans += (k + v[i] - 1) / v[i];
                }
                cout<<  ans << endl;
        }
}
```

Task F ()

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <assert.h>
#include <vector>
#include <algorithm>

using namespace std;

#define int long long

#define endl '\n'
#define all(v) v.begin(), v.end()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;

const int N = 1e6;

pii a[N];

pii operator+=(pii& a, pii b)
{
        a.first += b.first;
        a.second += b.second;
        return a;
}

pii operator+(pii a, pii b)
{
        return a += b;
}

int dp[N];

signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif
        ios_base::sync_with_stdio(0);
        cin.tie(0);
        int n;
        cin >> n;
        for (int i = 0; i < n; i++)
        {
                int l, r;
                cin >> l >> r;
                a[i] = { l,r };
        }
        fill(dp, dp + N, 1);
        int max1 = 0;
        for (int i = 0; i < n; i++)
        {
                max1 = max(max1, dp[i]);
                pii now = { 0,0 };
                for (int j = i; j < n; j++)
                {
                        now += a[j];
                        if (now.first <= 0 && now.second >= 0)
                        {
                                dp[j + 1] = max(dp[j + 1], dp[i] + 1);
                        }
                }
        }
        cout<< max(dp[n], max1);
}
```