Олимпиада СПбГУ по информатике 2020/21 учебного года

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

Task A ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>


using namespace std;


const int base = 10000;
const int sz = 112345;
const int ln = 4;


signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif // _DEBUG
        ios_base::sync_with_stdio(false);
        cin.tie(0); cout.tie(0);
        int k;
        cin >> k;
        if (k <= 10)
                cout << k % 10;
        else
        {
                k--;
                k = k % 9;
                if (k != 0)
                        k++;
                cout << k;
        }

        return 0;
}
```

Task B ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>


using namespace std;


//const int base = 10000;
//const int sz = 112345;
//const int ln = 4;


string s;
int n, k;
vector <char> used;


bool find(char x)
{
	for (auto y : used)
	{
		if (y == x)
			return true;
	}
	return false;
}


signed main()
{
#ifdef _DEBUG
	freopen("input.txt", "r", stdin);
#endif // _DEBUG
	ios_base::sync_with_stdio(false);
	cin.tie(0); cout.tie(0);
	cin >> n >> k;
	cin >> s;
	int ln = 0;
	int ans = 0;
	int ind = 0;
	for (auto x : s)
	{
		if (ln == k)
		{
			ans++;
			ln = 0;
			if (ind != n)
				ln++;
			used.clear();
			used.push_back(x);
			ind++;
			continue;
		}
		if (find(x))
		{
			ln++;
		}
		else
		{
			if (used.size() != 3)
			{
				used.push_back(x);
				ln++;
			}
			else
			{
```

```
                                ans++;
                                used.clear();
                                used.push_back(x);
                                ln = 0;
                                if (ind != n)
                                        ln++;
                        }
                }
                ind++;
        }
        cout << ans + int(ln != 0);
        return 0;
}
```

Task C ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>


using namespace std;


//const int base = 10000;
//const int sz = 112345;
//const int ln = 4;


signed main()
{
#ifdef _DEBUG
	freopen("input.txt", "r", stdin);
#endif // _DEBUG
	ios_base::sync_with_stdio(false);
	cin.tie(0); cout.tie(0);

	int n;
	int x, y;
	int sm = 0;
	cin >> n >> x >> y;
	vector <int> v(n), w(n);
	for (int i = 0; i < n; i++)
		cin >> v[i];
	for (int i = 0; i < n; i++)
	{
		cin >> w[i];
		sm += w[i];
	}

	vector <vector <int> > dp(n, vector <int>(x + 1, 0));

	for (int i = 0; i < n; i++)
	{
		for (int j = 0; j <= x; j++)
			if (i != 0)
				dp[i][j] = dp[i - 1][j];

		for (int j = x; j >= v[i]; j--)
		{
			int dd = 0;
			if (i != 0)
				dd = dp[i - 1][j - v[i]];
			if (dp[i][j] < dd + w[i])
				dp[i][j] = dd + w[i];
		}
	}

	int st = 0, mx = 0;
	for (int i = 0; i <= x; i++)
	{
		if (dp[n - 1][i] > mx)
		{
			mx = dp[n - 1][i];
			st = i;
		}
	}

	if (sm - mx > y)
	{
		cout << "-1";
		return 0;
	}
```

```
        vector <int> ans(n, 0);
        int cr = n - 1;
        while (st != 0)
        {
                if (cr == 0)
                {
                        ans[cr] = 1;
                        break;
                }
                if (dp[cr - 1][st] != dp[cr][st])
                {
                        ans[cr] = 1;
                        st -= v[cr];
                }
                cr--;
        }
        for (int i = 0; i < n; i++)
        {
                if (ans[i] == 1)
                        cout << "x";
                else
                        cout << "y";
        }
        return 0;
}
```

Task D ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>


using namespace std;



signed main()
{
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
#endif // _DEBUG
        ios_base::sync_with_stdio(false);
        cin.tie(0); cout.tie(0);

        int n;
        cin >> n;
        string s;
        cin >> s;
        vector <int> cr;
        for (int i = 0; i < 2 * n; i++)
        {
                int p = 1;
                if (s[i] == ']' || s[i] == '[')
                        p = 2;
                if (cr.size() != 0 && cr[cr.size() - 1] == p)
                        cr.pop_back();
                else
                        cr.push_back(p);
        }

        cout << cr.size() / 2;
        return 0;
}
```

Task E ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>
#include <random>


using namespace std;


//const int base = 10000;
//const int sz = 112345;
//const int ln = 4;


signed main()
{
#ifdef _DEBUG
	freopen("input.txt", "r", stdin);
#endif // _DEBUG
	/*ios_base::sync_with_stdio(false);
	cin.tie(0); cout.tie(0);*/

	string type;
	int test_cnt;
	cin >> type;
	cin >> test_cnt;
	for (int test_nb = 0; test_nb < test_cnt; test_nb++)
	{
		int n, k;
		cin >> n >> k;
		int base = n;
		int p = int(1e7 + 9) % base;
		vector <int> kk(k);
		////////////////////////////////////////////////////////////////
		if (type == "add")
		{
			for (int i = 0; i < k; i++)
				cin >> kk[i];

			int ret = p;
			for (auto x : kk)
			{
				ret += x;
				ret %= base;
			}
			if (ret == 0)
				cout << base;
			else
				cout << ret;
			cout << endl;

		}
		////////////////////////////////////////////////////////////////
		else
		{
			kk.push_back(0);
			int sm = p;
			for (int i = 0; i < k + 1; i++)
			{
				cin >> kk[i];
				sm += kk[i];
				sm %= base;
			}

			for (int ans = 0; ans < k + 1; ans++)
			{
```

```
                                if ((kk[ans] * 2) % base == sm)
                                {
                                        for (int i = 0; i < k + 1; i++)
                                        {
                                                if (i != ans)
                                                        cout << kk[i] << " ";
                                        }
                                        cout << endl;
                                        return 0;
                                }
                        }
                }
                ////////////////////////////////////////////////////////////////
        }

        return 0;
}
```

Task F ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <fstream>
#include <vector>
#include <algorithm>
#include <math.h>
#include <string>


using namespace std;



signed main()
{
#ifdef _DEBUG
	freopen("input.txt", "r", stdin);
#endif // _DEBUG
	ios_base::sync_with_stdio(false);
	cin.tie(0); cout.tie(0);

	int n;
	cin >> n;
	if (n == 1)
		cout << "17\n0 5\n1 5\n2 3\n4 3\n5 5\n5 4\n5 3\n5 2\n5 1\n5 0\n4 2\n3 0\n2 2\n1 0\
		    n0 2\n1 2\n0 3\n-1 -3";
	if (n == 2)
		cout << "12\n4 1\n4 0\n5 0\n5 1\n6 1\n6 2\n5 2\n5 3\n4 3\n4 2\n3 2\n3 1\n1 3\n-3 
		    0\n";
	if (n == 3)
		cout << "4\n-3 -3\n-3 -1\n-1 -1\n-1 -3\n-1 2\n1 2\n2 0\n";
	if (n == 4)
		cout << "4\n0 0\n0 1\n1 1\n1 0\n1 0\n0 -1\n-1 0\n0 1\n";
	if (n == 5)
		cout << "6\n0 0\n0 1\n1 2\n2 2\n2 1\n1 0\n-1 1\n1 2\n2 1\n1 -1\n-1 -2\n";
	if (n == 6)
		cout << "6\n0 0\n0 1\n1 2\n2 2\n2 1\n1 0\n-1 1\n1 2\n2 1\n1 -1\n-1 -2\n-2 -1\n";
	if (n == 7)
	{
		cout << "20\n0 0\n0 2\n1 2\n1 1\n2 1\n2 3\n4 3\n4 2\n3 2\n3 1\n5 1\n5 -1\n4 -1\n4 
		    0\n3 0\n3 -2\n1 -2\n1 -1\n2 -1\n2 0\n";
		cout << "-3 2\n2 3\n3 -2\n-2 -3\n-1 5\n5 1\n1 -5\n";
	}
	if (n == 8)
	{
		cout << "20\n0 0\n0 2\n1 2\n1 1\n2 1\n2 3\n4 3\n4 2\n3 2\n3 1\n5 1\n5 -1\n4 -1\n4 
		    0\n3 0\n3 -2\n1 -2\n1 -1\n2 -1\n2 0\n";
		cout << "-3 2\n2 3\n3 -2\n-2 -3\n-1 5\n5 1\n1 -5\n-5 -1\n";
	}
}
```