Олимпиада «Ломоносов» по информатике
2023-2024 учебный год. Заключительный тур
Работа участника с id заявки **1206852**, логином **inf24f_242**

Сводный итог по всем задачам в проверяющей системе

```
Run ID Time User name Problem Language Result Tests Score
13 0:10:46 inf24f_242 1 g++ OK 28 100
190 1:12:20 inf24f_242 2 g++ OK 28 100
392 2:35:55 inf24f_242 3 g++ Partial solution 15 48
298 1:59:17 inf24f_242 4 g++ Partial solution 8 35
97 0:40:49 inf24f_242 5 g++ OK 22 100
533 3:28:30 inf24f_242 6 g++ OK 11 100
483 технических балла
81 итоговый балл
```

Посылка по задаче 1

```
[1]  #include <bits/stdc++.h>
[2]
[3]  using namespace std;
[4]
[5]  #define int long long
[6]
[7]  #define watch(a) cout << #a << " = " << a << '\n';
[8]
[9]  void merge(vector<int>& res, vector<int>& v1, vector<int>& v2)
[10] {
[11]      res.clear();
[12]      int p1 = 0, p2 = 0;
[13]      while(p1 < v1.size() || p2 < v2.size())
[14]      {
[15]          if (p2 == v2.size() || (p1 < v1.size() && v1[p1] < v2[p2]))
[16]              res.push_back(v1[p1++]);
[17]          else
[18]              res.push_back(v2[p2++]);
[19]      }
[20] }
[21]
[22] vector<int> tetra;
[23]
[24] vector<bool> tut(int n)
[25] {
[26]      vector<bool> res(tetra.size(), 0);
[27]      for (int i = tetra.size() - 1; i >= 0; i--)
[28]      {
[29]          if (n >= tetra[i] && tetra[i] > 0)
[30]          {
[31]              res[i] = true;
[32]              n -= tetra[i];
[33]          }
[34]      }
[35]      return res;
[36] }
[37]
[38] signed main() {
[39]      ios_base::sync_with_stdio(false);
[40]      cin.tie(nullptr);
[41]      cout.tie(nullptr);
[42]      tetra.push_back(0);
[43]      tetra.push_back(0);
[44]      tetra.push_back(0);
[45]      tetra.push_back(1);
[46]      while (tetra.back() < 1e12)
[47]      {
[48]          int a = tetra.back();
[49]          int b = tetra[tetra.size() - 2];
[50]          int c = tetra[tetra.size() - 3];
[51]          int d = tetra[tetra.size() - 4];
[52]          tetra.push_back(a + b + c + d);
[53]      }
[54]      int size;
[55]      cin >> size;
[56]      vector<int> v(size);
[57]      for (auto& i : v)
[58]          cin >> i;
[59]      int res = 0;
[60]      for (auto& i : v)
[61]      {
[62]          vector<bool> b = tut(i);
[63]          int cnt = 0;
[64]          for (int i = 0; i < b.size(); i++)
[65]              if (b[i])
[66]                  cnt++;
[67]          if (cnt % 2 == 0)
[68]              res++;
[69]      }
[70]      cout << res << '\n';
[71]      return 0;
[72] }
```

Посылка по задаче 2

```
[1]    #include <bits/stdc++.h>
[2]
[3]    using namespace std;
[4]
[5]    #define int long long
[6]
[7]    #define watch(a) cout << #a << " = " << a << '\n';
[8]
[9]    void merge(vector<int>& res, vector<int>& v1, vector<int>& v2)
[10]   {
[11]        res.clear();
[12]        int p1 = 0, p2 = 0;
[13]        while(p1 < v1.size() || p2 < v2.size())
[14]        {
[15]            if (p2 == v2.size() || (p1 < v1.size() && v1[p1] < v2[p2]))
[16]                res.push_back(v1[p1++]);
[17]            else
[18]                res.push_back(v2[p2++]);
[19]        }
[20]   }
[21]
[22]   vector<int> tetra;
[23]
[24]   vector<bool> tut(int n)
[25]   {
[26]        vector<bool> res(tetra.size(), 0);
[27]        for (int i = tetra.size() - 1; i >= 0; i--)
[28]        {
[29]            if (n >= tetra[i] && tetra[i] > 0)
[30]            {
[31]                res[i] = true;
[32]                n -= tetra[i];
[33]            }
[34]        }
[35]        return res;
[36]   }
[37]
[38]   map<char, vector<int>> m;
[39]
[40]   vector<bool> used;
[41]
[42]   void read(string& a, int& ind, int depth = 0)
[43]   {
[44]        used[ind] = true;
[45]        char c = a[ind];
[46]        if (c == 'Q')
[47]        {
[48]            for (int i = 0; i< 8; i++)
[49]            {
[50]                ind++;
[51]                read(a, ind, depth + 3);
[52]            }
[53]        }
[54]        else
[55]            m[c][depth]++;
[56]   }
```

```
[57]
[58] void out(vector<int>& v)
[59] {
[60]     for (int i = v.size() - 1; i >= 0; i--)
[61]     {
[62]         while(v[i] >= 2)
[63]         {
[64]             v[i]-=2;
[65]             v[i-1]++;
[66]         }
[67]     }
[68]     while(v.back() == 0)
[69]         v.pop_back();
[70]
[71]     while(v.size() < 2)
[72]         v.push_back(0);
[73]
[74]     cout << v[0] << '.' << v[1];
[75]     for (int i = 2; i < v.size(); i++)
[76]         cout << v[i];
[77]
[78]
[79] }
[80]
[81] signed main()
[82] {
[83]     string col = "WROYGCBVD";
[84]     for (auto& i : col)
[85]         m[i].resize(10000, 0);
[86]     string a;
[87]     cin >> a;
[88]     used.resize(a.size(), false);
[89]     int d = 0;
[90]     read(a, d);
[91]     vector<pair<vector<int>, char>> v;
[92]     for (auto i : col)
[93]         v.push_back({m[i], -i});
[94]
[95]     sort(begin(v), end(v));
[96]
[97]     cout << char(-v.back().second) << '\n';
[98]     out(v.back().first);
[99]
[100]
[101]     return 0;
[102] }
```

Посылка по задаче 3

```
[1]    #include <bits/stdc++.h>
[2]
[3]    using namespace std;
[4]
[5]    #define int long long
[6]
[7]    #define watch(a) cout << #a << " = " << a << '\n';
[8]
[9]    vector<int> getnum(string& a)
[10]   {
[11]       vector<int> res(107, 0);
[12]       if (a[0] == '[')
[13]           return res;
[14]       for (int i = 0; i < a.size(); i++)
[15]       {
[16]           if (a[i] == '(' || a[i] == ')')
[17]               continue;
[18]           for (int j = i; j < i + 3; j++)
[19]           {
[20]               if (a[j] != '(' && a[j] != ')')
[21]               {
[22]                   int r = 0;
[23]                   if (a[i] == 'i')
[24]                       r = 1;
[25]                   if (a[i] == 'I')
[26]                       r = 4;
[27]                   if (a[i] == 'J')
[28]                       r = 7;
[29]                   if (a[i] == 'j')
[30]                       r = 10;
[31]                   r += j - i;
[32]                   res[i] += r;
[33]                   break;
[34]               }
[35]           }
[36]       }
[37]       for (int i = 0; i < res.size() - 1; i++)
[38]       {
[39]           while(res[i] >= 12)
[40]           {
[41]               res[i] -= 12;
[42]               res[i + 1]++;
[43]           }
[44]       }
[45]       reverse(begin(res), end(res));
[46]       return res;
[47]   }
[48]
[49]   signed main()
[50]   {
[51]       vector<string> num;
[52]       map<int, string> m;
[53]       m[0] = "[]";
[54]       num.push_back("[]");
[55]       num.push_back("i");
[56]       num.push_back("i(");
[57]       num.push_back("i((");
[58]       num.push_back("I");
[59]       num.push_back("I(");
[60]       num.push_back("I((");
[61]       num.push_back("J");
[62]       num.push_back("J)");
[63]       num.push_back("J))");
[64]       num.push_back("j");
[65]       num.push_back("j)");
[66]       num.push_back("j))");
[67]
```

```cpp
[68]
[69]      for (int i = 1; i <= 12; i++)
[70]      {
[71]          m[i] = num[i];
[72]          for (int j = 1; j <= 12; j++)
[73]          {
[74]              string a = num[i];
[75]              a.insert(a.end(), num[j].begin(), num[j].end());
[76]              m[i + j * 12] = a;
[77]              for (int k = 1; k <= 12; k++)
[78]              {
[79]                  string b = a;
[80]                  b.insert(b.end(), num[k].begin(), num[k].end());
[81]                  m[i + j * 12 + k * 144] = b;
[82]              }
[83]          }
[84]      }
[85]
[86]      int size;
[87]      cin >> size;
[88]      vector<vector<int>> v(size);
[89]
[90]      for (int i = 0; i < size; i++)
[91]      {
[92]          string a;
[93]          cin >> a;
[94]          v[i] = getnum(a);
[95]      }
[96]      int mn = 0, mx = 0;
[97]      for (int i = 1; i < size; i++)
[98]      {
[99]          if (v[i] <= v[mn])
[100]             mn = i;
[101]         if (v[i] >= v[mx])
[102]             mx = i;
[103]     }
[104]     if (mn > mx)
[105]         swap(mn, mx);
[106]     if (mn == mx)
[107]         cout << m[mn] << '\n' << m[mn + 1];
[108]     else
[109]         cout << m[mn + 1] << '\n' << m[mx + 1];
[110]
[111]     return 0;
[112] }
```

```
[1]    #include <bits/stdc++.h>
[2]
[3]    using namespace std;
[4]
[5]    #define int long long
[6]
[7]    #define watch(a) cout << #a << " = " << a << '\n';
[8]
[9]    void merge(vector<int>& res, vector<int>& v1, vector<int>& v2)
[10]   {
[11]       res.clear();
[12]       int p1 = 0, p2 = 0;
[13]       while(p1 < v1.size() || p2 < v2.size())
[14]       {
[15]           if (p2 == v2.size() || (p1 < v1.size() && v1[p1] < v2[p2]))
[16]               res.push_back(v1[p1++]);
[17]           else
[18]               res.push_back(v2[p2++]);
[19]       }
[20]   }
[21]
[22]   vector<int> tetra;
[23]
[24]   vector<bool> tut(int n)
[25]   {
[26]       vector<bool> res(tetra.size(), 0);
[27]       for (int i = tetra.size() - 1; i >= 0; i--)
[28]       {
[29]           if (n >= tetra[i] && tetra[i] > 0)
[30]           {
[31]               res[i] = true;
[32]               n -= tetra[i];
[33]           }
[34]       }
[35]       return res;
[36]   }
[37]
[38]   int countadd(int x, int y, int z, int ind, vector<vector<int>>& m)
[39]   {
[40]
[41]       if (x == y && y == z)
[42]           return m[x][ind];
[43]       if (x == y)
[44]           return m[x][ind] + m[z][ind];
[45]       if (x == z)
[46]           return m[x][ind] + m[y][ind];
[47]       if (y == z)
[48]           return m[x][ind] + m[y][ind];
[49]       return m[x][ind] + m[y][ind] + m[z][ind];
[50]   }
[51]
[52]   int min3(int a, int b, int c)
[53]   {
[54]       return min(a, min(b, c));
[55]   }
[56]
```

```
[57]  int max3(int a, int b, int c)
[58]  {
[59]      return max(a, max(b, c));
[60]  }
[61]
[62]  signed main()
[63]  {
[64]      int sizex, sizey;
[65]      cin >> sizex >> sizey;
[66]      int s1, s2, s3;
[67]      cin >> s1 >> s2 >> s3;
[68]      vector<vector<int>> v(sizex, vector<int>(sizey, 0));
[69]      for (auto& i : v)
[70]          for (auto& j : i)
[71]              cin >> j;
[72]      for (int i = 0;  i< sizex; i++)
[73]          if (i != s1 && i != s2 && i != s3)
[74]              v[i][0] = -100000000000;
[75]      vector<vector<vector<vector<int>>>> dp(sizey, vector<vector<vector<int>>>(sizex, vector<vector<int>>(sizex, vector<int>(sizex,0))));
[76]
[77]      dp[0][s1][s2][s3] = countadd(s1, s2, s3, 0, v);
[78]      for (int ind = 0; ind < sizey - 1; ind++)
[79]      {
[80]          for (int x = 0; x < sizex; x++)
[81]          {
[82]              for (int  y = 0; y < sizex; y++)
[83]              {
[84]                  for (int z = 0; z < sizex; z++)
[85]                  {
[86]                      for (int a = max(-1ll, -x); a <= min(1ll, sizex - 1 - x); a++)
[87]                      {
[88]                          for (int b = max(-1ll, -y); b <= min(1ll, sizex - 1 - y); b++)
[89]                          {
[90]                              for (int c = max(-1ll, -z); c <= min(1ll, sizex - 1 - z); c++)
[91]                              {
[92]                                  dp[ind + 1][x + a][y + b][z + c] = max(dp[ind + 1][x + a][y + b][z + c], dp[ind][x][y][z] + countadd(x + a, y + b, z + c, ind +1, v));
[93]                              }
[94]                          }
[95]                      }
[96]                  }
[97]              }
[98]          }
[99]      }
[100]
[101]     int r = 0;
[102]     for (int i = 0; i < sizex; i++)
[103]         for (int j = 0; j < sizex; j++)
[104]             for (int k = 0; k < sizex; k++)
[105]                 r = max(r, dp.back()[i][j][k]);
[106]
[107]     cout << r;
[108]
[109]     return 0;
[110] }
```

```
[1]    #include <bits/stdc++.h>
[2]
[3]    using namespace std;
[4]
[5]    #define int long long
[6]
[7]    #define watch(a) cout << #a << " = " << a << '\n';
[8]
[9]    void merge(vector<int>& res, vector<int>& v1, vector<int>& v2)
[10]   {
[11]       res.clear();
[12]       int p1 = 0, p2 = 0;
[13]       while(p1 < v1.size() || p2 < v2.size())
[14]       {
[15]           if (p2 == v2.size() || (p1 < v1.size() && v1[p1] < v2[p2]))
[16]               res.push_back(v1[p1++]);
[17]           else
[18]               res.push_back(v2[p2++]);
[19]       }
[20]   }
[21]
[22]   vector<int> tetra;
[23]
[24]   vector<bool> tut(int n)
[25]   {
[26]       vector<bool> res(tetra.size(), 0);
[27]       for (int i = tetra.size() - 1; i >= 0; i--)
[28]       {
[29]           if (n >= tetra[i] && tetra[i] > 0)
[30]           {
[31]               res[i] = true;
[32]               n -= tetra[i];
[33]           }
[34]       }
[35]       return res;
[36]   }
[37]
[38]   signed main() {
[39]       string a, b;
[40]       cin >> a >> b;
[41]       vector<int> cb(26,  0);
[42]       for (auto& i : b)
[43]           cb[i - 'a']++;
[44]       vector<vector<int>> ca(a.size(), vector<int>(26, 0));
[45]       ca[0][a[0] - 'a']++;
[46]       for (int i = 1; i < a.size(); i++)
[47]       {
[48]           ca[i] = ca[i-1];
[49]           ca[i][a[i] - 'a']++;
[50]       }
[51]       for (int i = 0; i < 26; i++)
[52]       {
[53]           if (cb[i] > ca.back()[i])
[54]               return 0;
[55]       }
```

```
[56]     int size = a.size();
[57]     pair<int, int> best = {0, a.size()};
[58]     for (int i = 0; i < a.size(); i++)
[59]     {
[60]         int l = i + 1, r = size;
[61]         while(r - l > 1)
[62]         {
[63]             int m = (l+r) /2;
[64]             vector<int> c = ca[m-1];
[65]             bool flag = true;
[66]             if (i == 0)
[67]             {
[68]                 for (int j = 0; j < 26; j++)
[69]                     if (c[j] < cb[j])
[70]                         flag = false;
[71]                 if (flag)
[72]                     r = m;
[73]                 else
[74]                     l = m;
[75]                 continue;
[76]             }
[77]             for (int j = 0; j < 26; j++)
[78]             {
[79]                 c[j] -= ca[i-1][j];
[80]                 if (c[j] < cb[j])
[81]                     flag = false;
[82]             }
[83]             if (flag)
[84]                 r = m;
[85]             else
[86]                 l = m;
[87]         }
[88]         vector<int> c = ca[r - 1];
[89]         bool flag = true;
[90]         if (i > 0) {
[91]             for (int j = 0; j < 26; j++)
[92]                 c[j] -= ca[i - 1][j];
[93]             for (int j = 0; j < 26; j++)
[94]                 if (c[j] < cb[j])
[95]                     flag = false;
[96]         }
[97]         if (flag == false)
[98]             break;
[99]         int right = r;
[100]        int len = r - i;
[101]        if (len < best.second)
[102]            best = {i, len};
[103]
[104]    }
[105]    for (int i = best.first; i < best.first + best.second; i++)
[106]        cout << a[i];
[107]    return 0;
[108] }
```

Посылка по задаче 6

```
[1]    #include <bits/stdc++.h>
[2]
[3]    using namespace std;
[4]
[5]    #define int long long
[6]
[7]    pair<string, vector<short>> readstring(string& a)
[8]    {
[9]        string name;
[10]       int ind = 0;
[11]       while(a[ind] != ';')
[12]           name.push_back(a[ind++]);
[13]       vector<short> v;
[14]       for (int i = 0; i < a.size(); i++)
[15]       {
[16]           if (a[i] != ';')
[17]               continue;
[18]           for (int j = i + 1; j < a.size(); j++)
[19]           {
[20]               if (a[j] != ';')
[21]                   continue;
[22]
[23]               string buff;
[24]               for (int k = i + 1; k < j; k++)
[25]                   buff.push_back(a[k]);
[26]               v.push_back(buff == "OK");
[27]               break;
[28]           }
[29]       }
[30]       return {name, v};
[31]   }
[32]
[33]   const int m1 = 2000000011;
[34]   const int m2 = 2000000099;
[35]   const int m3 = 2000000033;
[36]
[37]   vector<int> power1, power2, power3;
[38]
[39]   const int p = 7;
[40]
[41]   signed main()
[42]   {
[43]       power1.resize(1000007);
[44]       power1[0] = 1;
[45]       power2 = power1;
[46]       power3 = power1;
[47]       for (int i = 1; i < power1.size(); i++)
[48]       {
[49]           power1[i] = power1[i-1] * p % m1;
[50]           power2[i] = power2[i-1] * p % m2;
[51]           power3[i] = power3[i-1] * p % m3;
[52]       }
[53]       map<string, vector<vector<short>>> m;
[54]       string u;
```

```
[55]        while(cin >> u)
[56]        {
[57]            if (u.size() < 2)
[58]                break;
[59]            u.push_back(';');
[60]            auto p = readstring(u);
[61]            m[p.first].push_back(p.second);
[62]        }
[63]        map<string, int> anssize;
[64]        for (auto& i : m)
[65]        {
[66]
[67]            // debug
[68]            /* cout << i.first << '\n';
[69]            for (auto& k : i.second)
[70]            {
[71]                for (auto& l : k)
[72]                    cout << l;
[73]                cout << '\n';
[74]            }
[75]            */
[76]            //debug
[77]            int s = 0;
[78]            for (auto& j : i.second)
[79]                s = max(s, (int)j.size());
[80]            anssize[i.first] = s;
[81]            cout << anssize[i.first] << ' ';
[82]
[83]            vector<int> h1(s, 0), h2(s, 0), h3(s, 0);
[84]            for (int j = 0; j < i.second.size(); j++)
[85]            {
[86]                for (int k = 0; k < i.second[j].size(); k++)
[87]                {
[88]                    if (!i.second[j][k])
[89]                        continue;
[90]                    h1[k] += power1[j];
[91]                    h1[k] %= m1;
[92]                    h2[k] += power2[j];
[93]                    h2[k] %= m2;
[94]                    h3[k] += power3[j];
[95]                    h3[k] %= m3;
[96]                }
[97]            }
[98]            set<pair<int, pair<int,int>>> st;
[99]            for (int d = 0; d < s; d++)
[100]                st.insert({h1[d], {h2[d], h3[d]}});
[101]            cout << st.size() << '\n';
[102]        }
[103]
[104]        return 0;
[105] }
```