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1  /// Bismillahi-r-Rahmani-r-Rahim
2  #include<bits/stdc++.h>
3  using namespace std;
4  #define debug(args...){ string _s = #args;replace(_s.begin(),_s.end(),',',' ');stringstream
5  _ss(_s);istream_iterator<string>_it(_ss);err(_it, args);} cout<<endl;
6  void err(istream_iterator<string> it) {}
7  template<typename T, typename... Args>
8  void err(istream_iterator<string> it, T a, Args... args) {cerr << *it << "=" << a <<
9  ", "; err(++it,
10 args...);}
11 #define ll long long int
12 #define MAX 2134567891
13 #define PF(a) cout<<a<<endl;
14 #define pf(a) printf("%lld", a);
15 #define sf(a) scanf("%lld", &a);
16 #define fr(i,n) for(i=0;i<n;i++)
17 #define rep(i,n) for(i=1;i<=n;i++)
18 #define rev(i,a,n) for(i=n;i>=a;i--)
19 #define FOR(i,a,n) for(i=a;i<=n;i++)
20 #define ALL(n) n.begin(),n.end()
21 #define mem(x,n) memset(x,n,sizeof(x));
22 //int fx[]={+1,-1,+0,+0};
23 //int fy[]={+0,+0,+1,-1};
24 //int fx[]={+0,+0,+1,-1,-1,+1,-1,+1}; // Kings Move
25 //int fy[]={-1,+1,+0,+0,+1,+1,-1,-1}; // Kings Move
26 //int fx[]={-2,-2,-1,-1,1,1,2,2}; // Knights Move
27 //int fy[]={-1,1,-2,2,-2,2,-1,1}; // Knights Move
28 #define TC(t) printf("Case %lld: ",t);
29 #define ans(t,c) printf("Case %lld: %lld\n",t,c);
30 #define SETP(n) cout<<setprecision(n)<<fixed;
31 #define READ freopen("F:\\Project\\Test_Case.txt","r",stdin)
32 #define WRITE freopen("F:\\Project\\Output_Test.txt","w",stdout)
33 #define IO ios_base::sync_with_stdio(0); cin.tie(0);cout.tie(0);
34 #define PAIR pair<ll,ll>
35 #define MP make_pair
36 #define pb push_back
37 #define eb emplace_back
38 #define ff first
39 #define ss second
40 #define NL printf("\n");
41 #define bug(a) cout<<#a<<" "<<a<<" ";
42 #define hlw printf("hlw\n");
43 #define hii printf("hii\n");
44 #define NN 111
45 #define MOD (ll)1e9+7 /// 10^9+7
46 #define N (ll)1e6+7 ///10^6->6 zero after 1 **
47 ll x[N],y[N],z[N],n;
48 string s,S;
49 vector<ll>v;
50 //bitset<N>B;
51 //map <ll,ll> mp;
52 /// priority_queue<ll, vector<ll>, greater<ll> > pq;
53 int main()
54 {
55     //IO;
56     //while(1)
57     //READ;WRITE;
58     {
59         ll a=0,b=0,c=0,d,e,f,g,i,j,k,l,m,p,q,r,u,w,t,tc=1;

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59 ll in,loc,val,sz,lo,hi,mid,mn=MAX,mx=0,sum=0,ans=0;
60 //cin>>tc;
61 rep(t,tc)
62 {
63
64 }
65 }
66 return 0;
67 }
68 /// Division MOD needs BigMod(a,n-2)
69 //////////////////////////////////////
STRING////////////////////////////////////
70 unsigned bernstein_hash ( void *key, int len )
71 {
72 unsigned char *p = key;
73 unsigned h = 0;
74 int i;
75 for ( i = 0; i < len; i++ )
76 h = 33 * h + p[i];
77 return h;
78 }
79 /// string matching
80 vector<int> rabin_karp_HASH(string const& s, string const& t) {
81 const int p = 31;
82 const int m = 1e9 + 9;
83 int S = s.size(), T = t.size();
84 vector<long long> p_pow(max(S, T));
85 vector<long long> h(T + 1, 0);
86 long long h_s = 0;
87 vector<int> occurrences;
88 p_pow[0] = 1;
89 for (int i = 1; i < (int)p_pow.size(); i++)
90 p_pow[i] = (p_pow[i-1] * p) % m;
91 for (int i = 0; i < T; i++)
92 h[i+1] = (h[i] + (t[i] - 'a' + 1) * p_pow[i]) % m;
93 for (int i = 0; i < S; i++)
94 h_s = (h_s + (s[i] - 'a' + 1) * p_pow[i]) % m;
95 for (int i = 0; i + S - 1 < T; i++)
96 {
97 long long cur_h = (h[i+S] + m - h[i]) % m;
98 if (cur_h == h_s * p_pow[i] % m)
99 occurrences.push_back(i);
100 }
101 return occurrences;
102 }
103 /// KMP with LPS (find pattern)
104 void LPS()
105 {
106 ll i,j,l=pat.size();
107 i=0,j=-1;
108 lps[i]=j;
109 while(i<l)
110 {
111 while(pat[i]!=pat[j] && j>=0)
112 j=lps[j];
113 i++,j++;
114 lps[i]=j;
115 }
116 }
117 ll KMP(string txt)

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118 {
119     pat=txt; reverse(ALL(pat));
120     LPS(pat);
121     ll i,j,n,m;
122     n=txt.size();
123     m=pat.size();
124     i=j=0;
125     while(i<n)
126     {
127         while(j>=0 && txt[i]!=pat[j])
128             j=lps[j];
129         i++,j++;
130     }
131     return j;
132 }
133 string sub_pal(string s) /// Find Prefix Sub_Palindrome Linear
134 {
135     string a = s;
136     reverse(a.begin(), a.end());
137     a = s + "#" + a;
138     //cout<<a<<endl;
139     ll c = 0, pref[99]={0};
140     for (int i = 1; i < (int)a.size(); i++)
141     {
142         cout<<"C " <<c<<endl;
143         while (c != 0 && a[c] != a[i])
144             c = pref[c - 1];
145         if (a[c] == a[i])
146             c++;
147         pref[i] = c;
148     }
149     return s.substr(0, c);
150 }
151 string Manacher(string s) /// longest subpalindrome
152 {
153     string T="#"; // Transform S to T
154     for(int i=0;i<s.size();i++)
155         T+=s.substr(i,1)+"#";
156     int P[T.size()+5]={0}; // Array to record longest palindrome
157     int center=0,boundary=0,maxLen=0,resCenter=0;
158     for(int i=1;i<T.size()-1;i++)
159     {
160         int iMirror=2*center-i; // calc mirror i = center-(i-center)
161         if(i<boundary)
162             P[i]=min(boundary-i,P[iMirror]);
163         while(i-1-P[i]>=0 && i+1+P[i]<=T.size()-1 && T[i+1+P[i]]==T[i-1-P[i]]) // Attempt to
164             expand palindrome centered at i
165             P[i]++;
166         if(i+P[i]>boundary)
167         { // update center and boundary
168             center = i;
169             boundary = i+P[i];
170         }
171         if(P[i]>maxLen)
172         { // update result
173             maxLen = P[i];
174             resCenter = i;
175         }
176     }
177     return s.substr((resCenter - maxLen)/2, maxLen);

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178 }
179 vector<int>z_algo(string s) /// finds all occurrences of a pattern linear
180 {
181     int i,l,r,n;
182     n=s.length();
183     vector<int> z(n);
184     for (i = 1, l = 0, r = 0; i < n; ++i)
185     {
186         if (i <= r)
187             z[i] = min (r - i + 1, z[i - 1]);
188         while (i + z[i] < n && s[z[i]] == s[i + z[i]]) ///Checking character and ++1
189             ++z[i];
190         if (i + z[i] - 1 > r)
191             l = i, r = i + z[i] - 1;
192     }
193     return z;
194 }
195 //////////////////////////////////////////////////Sparse Table
196 ll st[22][N],x[N],logs[N];
197 void build(ll n)/// 0
198 {
199     ll i,j,k;
200     logs[1]=0; for(i=2;i<=n;i++)logs[i]= logs[i/2]+1;
201     for(i=0;i<n;i++)st[0][i]=x[i];
202     for(i=1; (1<<i) <n; i++)
203     {
204         for(j=0; j+(1<<i)<=n; j++) /// 1<<i = current_len
205         {
206             st[i][j]=min(st[i-1][j], st[i-1][j + (1<<i-1)]);
207         }
208     }
209 }
210 ll query(ll l, ll r)
211 {
212     ll pow = logs[r-l+1]; ///log2(r-l+1);
213     return min(st[pow][l], st[pow][r-(1<<pow)+1]);
214 }
215 build(n); cout<<query(l,r)<<endl;
216 //////////////////////////////////////////////////Segment
Tree////////////////////////////////////
217 ll tree[4*N],tr[N],lazy[4*N];
218 void build(ll in,ll L,ll R)
219 {
220     if(L==R)
221     {
222         tree[in]=tr[L];
223         return;
224     }
225     ll mid=(L+R)/2;
226     build(in*2,L,mid);
227     build(in*2+1,mid+1,R);
228     tree[in]=min(tree[in*2],tree[in*2+1]); /// Change Function
229 }
230 void lazy_update (ll in,ll L,ll R,ll x,ll y,ll val)
231 {
232     if(x>y)return;
233     if(lazy[in]!=0)
234     {
235         tree[in]+=lazy[in];
236         if(L!=R)

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237 {
238     lazy[in*2]+=lazy[in];
239     lazy[in*2+1]+=lazy[in];
240 }
241 lazy[in]=0;
242 }
243 if(x>R || y<L)return;
244 if(x<=L && y>=R)
245 {
246     tree[in]+=val;
247     if(L!=R)
248     {
249         lazy[in*2]+=val;
250         lazy[in*2+1]+=val;
251     }
252     return;
253 }
254 ll mid=(L+R)/2;
255 lazy_update(in*2,L,mid,x,y,val);
256 lazy_update(in*2+1,mid+1,R,x,y,val);
257 tree[in]=tree[in*2]+tree[in*2+1];
258 }
259 ll lazy_query(ll in,ll L,ll R,ll x,ll y)
260 {
261     if(x>y)return 0;
262     if(lazy[in]!=0)
263     {
264         tree[in]+=lazy[in];
265         if(L!=R)
266         {
267             lazy[in*2]+=lazy[in];
268             lazy[in*2+1]+=lazy[in];
269         }
270         lazy[in]=0;
271     }
272     if(x>R || y<L)return 0;
273     if(x<=L && y>=R)
274         return tree[in];
275     ll p,q,mid=(L+R)/2;
276     p=lazy_query(in*2,L,mid,x,y);
277     q=lazy_query(in*2+1,mid+1,R,x,y);
278     return p+q;
279 }
280 void update(ll in,ll L,ll R,ll pos,ll val)
281 {
282     if(pos>R||L>pos)return;
283     if(L==R&&pos==L)
284     {
285         tree[in]+=val; /// Change Function
286         return;
287     }
288     ll mid=(L+R)/2;
289     update(in*2,L,mid,pos,val);
290     update(in*2+1,mid+1,R,pos,val);
291     tree[in]=tree[in*2]+tree[in*2+1]; /// Change Function
292 }
293 ll query(ll L,ll R,ll in,ll i,ll j)
294 {
295     if(j<L||i>R)return MAX;
296     //return 0;

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297 if(L>=i&& j>=R) return tree[in];
298 ll p,q,mid=(L+R)/2;
299 p=query(L,mid,in*2,i,j);
300 q=query(mid+1,R,in*2+1,i,j);
301 return min(p,q); /// Change Function
302 }
303 build(1,1,n); cout<<query(1,n,1,a,b)<<endl;
304 lazy_update(1,1,n,a,b,c); cout<<lazy_query(1,n,1,a,b)<<endl;
305 ////////////////////////////////////DP////////////////////////////////////
306 ll LCS(char p[],char q[],int a,int b)
307 {
308     ///All loop will work through 1 to n/m here...
309     int i,j,k;
310     rep(i,a)
311     x[i][0]=0;
312     rep(i,b)
313     x[0][i]=0;
314     rep(i,a)
315     rep(j,b)
316     {
317         if(p[i]==q[j])x[i][j]=x[i-1][j-1]+1;
318         else x[i][j]=max(x[i][j-1],x[i-1][j]);
319     }
320     return x[a][b];
321 }
322 ll LIS(ll n)
323 {
324     ll i,a,in=0,st,en,mid,ans=-1;
325     ar[1]=INT_MIN;
326     rep(i,n)
327     {
328         a=x[i];
329         if(in==0 || a>ar[in])
330         {
331             cout<<"Appending "<<a<<" in "<<1+in<<endl;
332             ar[++in]=a;
333         }
334         else if(a<x[1])
335             ar[1]=a;
336         else
337         {
338             st=1,en=in;
339             while(st<=en)
340             {
341                 mid=(st+en)/2;
342                 if(ar[mid]<a)
343                     st=mid+1;
344                 else en=mid-1;
345             }
346             ar[st]=a;
347             cout<<mid<<" mid\n";
348         }
349         cout<<"i "<<i<<" a "<<a<<" in "<<in<<endl;
350     }
351     return in;
352 }
353 ////////////////////////////////////BIT////////////////////////////////////
354 void update(ll pos,ll val)
355 {
356     while(pos<=n)

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357 {
358     x[pos]+=val;
359     pos+=(pos & -pos);
360 }
361 }
362 ll query(ll pos)
363 {
364     ll sum=0;
365     while(pos)
366     {
367         sum+=x[pos];
368         pos-=(pos & -pos);
369     }
370     return sum;
371 }
372 rep(i,n)
373 {cin>>a; update(i,a); /// 1-based}
374 cout<<query(4)<<" "<<query(2)<<" Ans "<<query(4)-query(2)<<endl;
375 //////////////////////////////////MATH////////////////////////////////////
376 ll spf[N]; vector<ll>primes;
377 void sieve() ///with SPF
378 {
379     for(int i = 2; i < N; i++)
380     {
381         if (spf[i] == 0) spf[i] = i, primes.push_back(i);
382         int sz = primes.size();
383         for (int j=0; j<sz && i*primes[j]<N && primes[j]<=spf[i]; j++)
384         {
385             spf[i * primes[j]] = primes[j];
386         }
387     }
388 }
389 ll nCr(ll n,ll r) /// nCr DP
390 {
391     ll &ret=dp[n][r];
392     if(~ret)return ret;
393     if(n==r)return ret=1;
394     if(r==1)return ret=n;
395     return ret=nCr(n-1,r)+nCr(n-1,r-1);
396 }
397 ll bigmod(ll n,ll p,ll MOD) /// finds n ^ p % MOD
398 {
399     if(p==0)return 1;
400     ll x=bigmod(n,p/2,MOD);
401     x=(x*x)%MOD;
402     if(p%2)x=(x*n)%MOD;
403     return x;
404 }
405 ll precal_nCr(ll n, ll r) /// larger inputs and MOD required
406 {
407     /// Precal Starts Here
408     fact[1] = 1;
409     for(ll i=2; i<n; i++) fact[i] = (i*fact[i-1])%MOD;
410     invfact[n-1] = bigmod(fact[n-1], MOD-2, MOD);
411     for (ll i=n-2; i>=0; i--) invfact[i] = (invfact[i+1]*(i+1))%MOD;
412     /// Precal Ends Here
413     if (r<0 || r>n) return 0;
414     return (fact[n]*(invfact[r]*invfact[n-r])%MOD)%MOD;
415 }
416 void permutation(string s,int i,int n)

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```

417 {
418     if(i==n){cout<<s<<endl;return ;}
419     for(int j=i;j<=n;j++)
420     {
421         swap(s[i],s[j]);
422         permutation(s,i+1,n);
423     }
424 }
425 ll mod_inverse(ll a,ll mod)
426 {
427     return bigmod(a,mod-2,mod);
428 }
429 void allPossibleSubset(int n)
430 {
431     for(ll mask = 0; mask < (1 << n); mask++) {
432         ll sum_of_this_subset = 0;
433         for(int i = 0; i < n; i++)
434         {
435             if(mask & (1 << i)) {
436                 sum_of_this_subset += x[i];
437             }
438         }
439     }
440 }
441 /// Find numbers of co-prime of N which are less than N
442 void totient()
443 {
444     ll i,j,k;
445     for(i=1;i<=N;i++)phi[i]=i;
446     for(i=2;i<=N;i++)
447     {
448         if(phi[i]==i)
449         {
450             for(j=i;j<=N;j+=i)
451             {
452                 phi[j]= (phi[j]*(i-1))/i;
453             }
454         }
455     }
456 }
457 /// Find eulerphi for any numbers with prime pre-calculated
458 int eulerPhi ( int n ) {
459     int res = n;
460     int sqrtn = sqrt ( n );
461     for ( int i = 0; i < prime.size() && prime[i] <= sqrtn; i++ ) {
462         if ( n % prime[i] == 0 ) {
463             while ( n % prime[i] == 0 ) {
464                 n /= prime[i];
465             }
466             sqrtn = sqrt ( n );
467             res /= prime[i];
468             res *= prime[i] - 1;
469         }
470     }
471     if ( n != 1 ) {
472         res /= n;
473         res *= n - 1;
474     }
475     return res;
476 }

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[illegible]

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537 ll i, in;
538 last[s]=k;
539 nodes[k]=s;
540 depth[k++]=d;
541 fr(i,v[s].size())
542 {
543   in=v[s][i];
544   if(vis[in])continue;
545   vis[in]=1;
546   walk(in,d+1);
547   nodes[k]=s;
548   depth[k++]=d;
549 }
550 }
551 void sparse_table(ll n)/// 0 based indexing
552 {
553   ll node_a,node_b,i,j,k;
554   for(i=0;i<n;i++)st[0][i]=i; /// storing nodes, not values
555   for(i=1; (1<<i) <n; i++)
556   {
557     for(j=0; j+(1<<i)<=n; j++) /// 1<<i = current_len
558     {
559       node_a=st[i-1][j];
560       node_b=st[i-1][j + (1<<i-1)];
561       st[i][j] = depth[node_a]<=depth[node_b]? node_a:node_b; /// For RMQ
562     }
563   }
564 }
565 ll LCA(ll l,ll r)
566 {l=last[l],r=last[r];if(l>r)swap(l,r);ll pow = log2(r-l+1);ll a,b;a=st[pow][l];
  b=st[pow][r-(1<<pow)+1];return nodes[depth[a]<=depth[b]? a:b];}
567 int main(){ ///0 based indexing
568   vis[0]=1;
569   walk(0,0);
570   sparse_table(2*n-1);
571   cin>>a>>b; cout<<LCA(a-1,b-1)+1<<endl;
572 }

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