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Sonya and string shifts

Attempted by: **112** / Accuracy: **18%** / ★★★★☆

Tag(s): Medium-Hard

PROBLEM **EDITORIAL** **MY SUBMISSIONS** **ANALYTICS**

The problem "Sonya and string shifts " doesn't have any editorial. You can contribute it by sending editorial in markdown format to moderator@hackerearth.com.

Author Solution by Boris Sokolov

```
#include <bits/stdc++.h>
using namespace std;

const int INF = 2e9;
const int N = (int)1e6 + 9;
const int alphabet = 26;

char s[N];
int p[N], cnt[N], c[N], pn[N], cn[N], ans[N];
vector<int> v[N];

int main() {
    int n;
    scanf("%d\n", &n);
    gets(s);
    memset(cnt, 0, alphabet * sizeof(int));
    for (int i = 0; i < n; ++i) {
        ++cnt[s[i] - 'a'];
    }
    for (int i = 1; i < alphabet; ++i) {
        cnt[i] += cnt[i - 1];
    }
    for (int i = 0; i < n; ++i) {
        p[--cnt[s[i] - 'a']] = i;
    }
    c[p[0]] = 0;
    int classes = 1;
    for (int i = 1; i < n; ++i) {
        if (s[p[i]] != s[p[i - 1]]) {
            ++classes;
        }
        c[p[i]] = classes - 1;
    }
    for (int h = 0; (1 << h) < n; ++h) {
```

```
                for (int i = 0; i < n; ++i) {
                        pn[i] = p[i] - (1 << h);
                        if (pn[i] < 0) {
                                pn[i] += n;
                        }
                }
                memset(cnt, 0, classes * sizeof(int));
                for (int i = 0; i < n; ++i) {
                        ++cnt[c[pn[i]]];
                }
                for (int i = 1; i < classes; ++i) {
                        cnt[i] += cnt[i - 1];
                }
                for (int i = n - 1; i >= 0; --i) {
                        p[--cnt[c[pn[i]]]] = pn[i];
                }
                cn[p[0]] = 0;
                classes = 1;
                for (int i = 1; i < n; ++i) {
                        int mid1 = (p[i] + (1 << h)) % n;
                        int mid2 = (p[i - 1] + (1 << h)) % n;
                        if (c[p[i]] != c[p[i - 1]] || c[mid1] != c[mid2]) {
                                ++classes;
                        }
                        cn[p[i]] = classes - 1;
                }
                memcpy(c, cn, n * sizeof(int));
        }
        vector<int> minShifts;
        for (int i = 0; i < n; ++i) {
                if (minShifts.empty() || minShifts.back() > p[i]) {
                        minShifts.push_back(p[i]);
                }
        }
        int q;
        scanf("%d", &q);
        for (int i = 0; i < q; ++i) {
                int k;
                scanf("%d", &k);
                v[k].push_back(i);
        }
        int cur = INF;
        for (int k = 0; k < n; ++k) {
                while (!minShifts.empty() && minShifts.back() <= k) {
                        cur = minShifts.back();
                        minShifts.pop_back();
                }
                for (int i = 0; i < v[k].size(); ++i) {
                        ans[v[k][i]] = cur;
                }
        }
        for (int i = 0; i < q; ++i) {
                printf("%d\n", ans[i]);
        }
        return 0;
}
```

Tester Solution

```
#include <cstdio>
#include <iostream>
#include <algorithm>
#include <vector>
#include <queue>
#include <stack>
#include <set>
#include <map>
#include <cstring>
#include <cstdlib>
#include <cmath>
#include <string>
#include <memory.h>
#include <sstream>
#include <complex>

#define REP(i,n) for(int i = 0, _n = (n); i < _n; i++)
#define REPD(i,n) for(int i = (n) - 1; i >= 0; i--)
#define FOR(i,a,b) for (int i = (a), _b = (b); i <= _b; i++)
#define FORD(i,a,b) for (int i = (a), _b = (b); i >= _b; i--)
#define FORN(i,a,b) for(int i=a;i<b;i++)
#define FOREACH(it,c) for (__typeof((c).begin()) it=(c).begin();it!=(c).end();it++
#define RESET(c,x) memset (c, x, sizeof (c))

#define sqr(x) ((x) * (x))
#define PB push_back
#define MP make_pair
#define F first
#define S second
#define Aint(c) (c).begin(), (c).end()
#define SIZE(c) (c).size()

#define DEBUG(x) { cerr << #x << " = " << x << endl; }
#define PR(a,n) {cerr<<#a<<" = "; FOR(_,1,n) cerr << a[_] << ' '; cerr <<endl;}
#define PR0(a,n) {cerr<<#a<<" = ";REP(_,n) cerr << a[_] << ' '; cerr << endl;}
#define ll long long
using namespace std;

const double PI = 2.0 * acos (0.0);

typedef pair <int, int> PII;


#define SZ(x) ((int)(x.size()))

#define maxn 2000009
#define maxlogn 22

```

```
string s;
int n;
int sa[maxn],tam[maxn],inv[maxn],key[maxn],lcp[maxn],posa[maxn],myrank[maxn];
int rmq[maxn][maxlogn],LOG[maxn];
int ans[maxn];

void initSA() {
    int i,h,x;
    memset(tam,0,sizeof(tam));
    FOR(i,1,n) tam[s[i]]++;
    FOR(i,1,256) tam[i] += tam[i-1];
    cout << n << " done" << endl;
    FORD(i,n,1) sa[tam[s[i]]--] = i;
    x = 0;
    posa[0] = 1;
    key[sa[1]] = 0;
    FOR(i,2,n) {
        if (s[sa[i]] != s[sa[i-1]]) posa[++x] = i;
        key[sa[i]] = x;
    }
    h = 1;
    while (h < n) {

        FOR(i,1,n) tam[i]=sa[i];

        FOR(i,1,n) if (tam[i] > h) {
            x = tam[i] - h;
            sa[posa[key[x]]] = x;
            posa[key[x]]++;
        }

        x = 0;
        posa[0] = 1;
        tam[sa[1]] = 0;
        FOR(i,2,n) {
            if ((key[sa[i-1]] < key[sa[i]]) || ((key[sa[i-1]] == key[sa[i]]) &&
                posa[++x] = i;
            tam[sa[i]] = x;
        }
        FOR(i,1,n) key[i] = tam[i];
        if (x == n-1) break;
        h = h << 1;
    }

    FOR(i,1,n) myrank[sa[i]]=i;
}

void initLCP() {
    int i,j,h = 0,x;
    s[n + 1] = 0;
    int result = 0;
    FOR(i,1,n) inv[sa[i]] = i;
    FOR(i,1,n)
        if (inv[i] == 1) lcp[1] = 0;
        else {
            x = inv[i];
            j = sa[x - 1];
            while (s[j + h] == s[i + h]) h++;
            lcp[x] = h;
            if (h > 0) h--;
        }
}

void initRMQ() {
    LOG[1]=0;
    FOR(i,2,n) if((1<<(LOG[i-1]+1))==i) LOG[i]=LOG[i-1]+1; else LOG[i]=LOG[i-1];

    FOR(i,1,n) rmq[i][0]=lcp[i];

    FOR(j,1,LOG[n]) {
        FOR(i,1,n-(1<<j)+1) {
            rmq[i][j]=min(rmq[i][j-1],rmq[i+(1<<(j-1))][j-1]);
        }
    }
}

int getRMQ(int x,int y) {
    int len=LOG[y-x+1];
    return min(rmq[x][len],rmq[y-(1<<len)+1][len]);
}

int getLCP(int x,int y) {
    x=myrank[x];
    y=myrank[y];
    if(x==y) return n-x+1;
    if(x>y) swap(x,y);
    return getRMQ(x+1,y);
}

int main() {

    ios_base::sync_with_stdio(0);

    int N,q;

    cin >> N >> s >> q;
    s = " " + s;
    n=s.length();

    initSA();
    initLCP();
    initRMQ();

    int curind=1,curmin=inv[1];
    for(int i=2; i<=N; i++){
        if(inv[i]<curmin){
            if(getLCP(inv[i], curmin) < N)
                curind=i,curmin=inv[i];
        }
        ans[i]=curind;
    }
    for(int i=0; i<q; i++){
        int x;
        cin >> x;
        printf("%d\n",max(0,ans[x+1]-1));
    }

}
```

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SHUBHAM PANDEY 5 months ago

please explain something
this code dosen't mean anything

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Prakhar Agrawal 4 months ago

How can we submit the editorial for the above question ?

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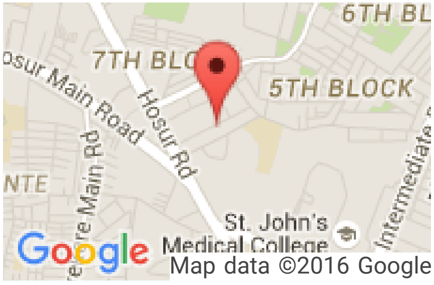
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