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#pragma comment(linker, "/STACK:102400000,102400000")

#include <cstdio>

#include <iostream>

#include <algorithm>

#include <vector>

#include <set>

#include <map>

#include <string>

#include <cstring>

#include <stack>

#include <queue>

#include <cmath>

#include <ctime>

#include <utility>

using namespace std;

#define REP(I,N) for (I=0;I<N;I++)

#define rREP(I,N) for (I=N-1;I>=0;I--)

#define rep(I,S,N) for (I=S;I<N;I++)

#define rrep(I,S,N) for (I=N-1;I>=S;I--)

#define FOR(I,S,N) for (I=S;I<=N;I++)

#define rFOR(I,S,N) for (I=N;I>=S;I--)

typedef unsigned long long ULL;

typedef long long LL;

const int INF=0x3f3f3f3f;

const LL INFF=0x3f3f3f3f3f3f3f3fll;

const LL M=1e9+7;

const LL maxn=1e6+7;

const double eps=0.00000001;

LL gcd(LL a,LL b){return b?gcd(b,a%b):a;}

template<typename T>inline T abs(T a) {return a>0?a:-a;}

template<typename T>inline T powMM(T a,T b){T ret=1;for (;b;b>>=1ll,a=a\*a%M) if (b&1) ret=1ll\*ret\*a%M;return ret;}

头文件在上面~~~~~~

杂物

int ans;

void fqsort(int l,int r)//第k大

{

int le=l,ri=r,m;

m=a[le];

while (le<ri)

{

while (le<ri&&a[ri]<=m) ri--;

a[le]=a[ri];

while (le<ri&&a[le]>=m) le++;

a[ri]=a[le];

}

if (le==k) printf("%d\n",m);

else if (le>k) fqsort(l,le-1);

else fqsort(le+1,r);

}

void msort(int le,int ri)//逆序对

{

if (le==ri) return;

int mid=(le+ri)>>1,l1=le,r1=mid+1,k1=l1;

msort(le,mid); msort(r1,ri);

while (l1<=mid||r1<=ri)

{

if (l1==mid+1) {b[k1++]=a[r1++]; ans+=mid-l1+1;}

else if (r1==ri+1) b[k1++]=a[l1++];

else if (a[l1]<=a[r1]) b[k1++]=a[l1++];

else {b[k1++]=a[r1++]; ans+=mid-l1+1;}

}

for (l1=le;l1<=ri;l1++) a[l1]=b[l1];

}

**输入挂**

int n,m;

char s[maxn],str[maxn];

int len1,len2,p[maxn],ans;

template<class T>

bool read\_d(T &num){

char in;bool IsN=false;

in=getchar();

if (in==EOF) return false;

while (in!= '-'&&(in<'0'||in>'9')) in=getchar();

if (in=='-') {IsN=1;num=0;}

else num=in-'0';

while (in=getchar(),in>='0'&&in<='9') num=num\*10+in-'0';

if (IsN) num=-num;

return 1;

}

template<class T>

bool read\_f(T &num){

char in;bool IsN=false,IsD=false;

T Dec=0.1;

in=getchar();

if (in==EOF) return false;

while (in!='-'&&in!='.'&&(in<'0'||in>'9')) in=getchar();

if (in=='-') {IsN=1;num=0;}

else if (in=='.') {IsD=1;num=0;}

else num=in-'0';

if (!IsD)

while (in=getchar(),in>='0'&&in<='9') num=num\*10+in-'0';

if (in=='.')

while (in=getchar(),in>='0'&&in<='9') {num+=Dec\*(in-'0');Dec\*=0.1;}

if (IsN) num=-num;

return 1;

}

LL d;

double c;

int main(){

int i;

while (read\_f(c)){

printf("%lf\n",c);

}

}

# 字符串的

KMP

LL n,m;

char s[M],a[N];

LL Next[N];

LL i,j,k,t;

void init(char \*a,LL \*Next){

Next[0]=-1;

int len=strlen(a);

register int i,j;

FOR(i,1,len-1){

j=Next[i-1];

while (j>=0&&a[j+1]!=a[i]) j=Next[j];

if (a[i]==a[j+1]) Next[i]=j+1;

else Next[i]=-1;

}

}

int kmp(char \*s,char \*a,LL \*Next){

int Len=strlen(s),len=strlen(a);

register int i,j=-1;

REP(i,Len){

while (j>=0&&a[j+1]!=s[i]) j=Next[j];

if (s[i]==a[j+1]) j++;

if (j==len-1) return i-len+1;

}return -1;

}

int main(){

while (~scanf("%s%s",&s,&a)){

init(a,Next);

n=strlen(a);

t=kmp(s,a,Next);

if (~t) printf("%d",t+1);

else printf("Not Found!");

puts("");

}

}

字典树

LL n,m;

LL a[N][27],f[N],ff[N];//ff[N]:num

LL i,j,k;

int cnt;

string s;

inline void insert(string str){

int len=str.length(),now=0;

int i;

REP(i,len){

if (!a[now][str[i]-'a']) a[now][str[i]-'a']=++cnt;

now=a[now][str[i]-'a'];

++f[now];//表示小于等于这个的有多少

}

ff[now]++;//==的

}

int calc(string str){//小于str的

int len=str.length(),now=0,ans=0;

int i,j;

REP(i,len){

REP(j,str[i]-'a')

ans+=f[a[now][j]];

// if (i!=len-1)//等于的也加

ans+=ff[a[now][str[i]-'a']];

now=a[now][str[i]-'a'];

if (now==0) break;

}

return ans;//求大的要再加上后面的

}

int findstr(string str){//等于的

int len=str.length(),now=0,ans=0,i;

REP(i,len){

now=a[now][str[i]-'a'];

if (now==0) return 0;

}

return ans=ff[now];//可能==0

}

int main(){

scanf("%d%d",&n,&m);

REP(i,n) {cin>>s;insert(s);}

REP(i,m) {cin>>s;cout<<calc(s)<<'\n';}

}

**//维护val //left,right各一个**

**//求i<j<k&&i^j<j^k的三元组个数**

int T;

int n;

LL ans;

int i,j;

int a[maxn\*32];

int nxt[maxn\*32][2];

LL num[maxn\*32],last[maxn\*32];

LL sum[maxn][32][2];//只有这位。。。

int cnt,now;

int main()

{

scanf("%d",&T);

while (T--){

ans=0;

cnt=0;

scanf("%d",&n);

FOR(i,1,n) scanf("%d",&a[i]);

FOR(i,1,n){

rREP(j,32){

int mark=((a[i]&(1<<j))!=0);

sum[i][j][0]=sum[i-1][j][0];

sum[i][j][1]=sum[i-1][j][1];

sum[i][j][mark]++;

}

}

rFOR(i,1,n){

now=0;

rREP(j,32){

int mark=((a[i]&(1<<j))!=0);

if (nxt[now][mark^1])

ans+=last[nxt[now][mark^1]]-num[nxt[now][mark^1]]\*sum[i][j][mark];

if (!nxt[now][mark]) break;

now=nxt[now][mark];

}

now=0;

rREP(j,32){

int mark=((a[i]&(1<<j))!=0);

if (!nxt[now][mark]) nxt[now][mark]=++cnt;

now=nxt[now][mark];

last[now]+=sum[i-1][j][mark^1];//这点之前

num[now]++;

}

}

printf("%lld\n",ans);

FOR(i,0,cnt) num[i]=last[i]=nxt[i][0]=nxt[i][1]=0;

FOR(i,1,n)

REP(j,32) sum[i][j][0]=sum[i][j][1]=0;

}

}

AC自动机

**//HDU2222多串在一个串内出现次数**

const int maxtot=50\*10007;//个数

const int charnum=26;

int nxt[maxtot][charnum],fail[maxtot],num[maxtot];

int cnt;

queue<int> Q;

void init(){

int i,j;

while (Q.size()) Q.pop();

REP(i,maxtot) {

REP(j,charnum) nxt[i][j]=0;

num[i]=fail[i]=0;

}

cnt=1;

}

inline void insert(char \*str){

int len=strlen(str),now=0,i;

REP(i,len){

int k=str[i]-'a';

if (!nxt[now][k]) nxt[now][k]=cnt++;

now=nxt[now][k];

}

num[now]++;

}

inline void buildAC(){

fail[0]=-1;

Q.push(0);

int i;

while (Q.size()){

int x=Q.front();Q.pop();

REP(i,charnum) if (nxt[x][i]){

if (x==0) fail[nxt[x][i]]=0;

else {

int p=fail[x];

while (p!=-1&&!nxt[p][i]) p=fail[p];//注意这里是nxt[p][i]

if (p!=-1) fail[nxt[x][i]]=nxt[p][i];

else fail[nxt[x][i]]=0;

}

Q.push(nxt[x][i]);

}

}

}

inline int match(char \*str){

int len=strlen(str),now=0;

int i,ret=0;

REP(i,len){

int k=str[i]-'a';

while (now&&!nxt[now][k]) now=fail[now];

now=nxt[now][k];

if (now==-1) now=0;

int tmp=now;

while (tmp){

if (num[tmp]==-1) break;//vis

ret+=num[tmp];

num[tmp]=-1;

tmp=fail[tmp];

}

}

return ret;

}

int T,i,n;

char s[maxn];

int main(){

scanf("%d",&T);

while (T--){

scanf("%d",&n);

init();

REP(i,n){

scanf("%s",s);

insert(s);

}

buildAC();

scanf("%s",s);

printf("%d\n",match(s));

}

}

**//HDU2896输出串**

int ans[505],num;//标记

const int tot=505; const int maxtot=505\*140; const int charnum=98;

int nxt[maxtot][charnum],fail[maxtot],mark[maxtot];

int cnt;

queue<int> Q;

void init(){

int i,j;

while (Q.size()) Q.pop();

REP(i,maxtot){

REP(j,charnum) nxt[i][j]=0;

mark[i]=fail[i]=0;

}

cnt=1;

}

inline void insert(char \*str,int id){

int len=strlen(str),now=0,i;

REP(i,len){

int k=str[i]-33;

if (!nxt[now][k]) nxt[now][k]=cnt++;

now=nxt[now][k];

}

mark[now]=id;

}

inline void buildAC(){

fail[0]=-1;

Q.push(0);

int i;

while (!Q.empty()){

int x=Q.front();Q.pop();

REP(i,charnum) if (nxt[x][i]){

if (x==0) fail[nxt[x][i]]=0;

else{

int p=fail[x];

while (p!=-1&&!nxt[p][i]) p=fail[p];//这里注意

if (p!=-1) fail[nxt[x][i]]=nxt[p][i];

else fail[nxt[x][i]]=0;

}

Q.push(nxt[x][i]);

}

}

}

inline void match(char \*str){

int len=strlen(str),now=0;

int i;

num=0;

REP(i,tot) ans[i]=0;

REP(i,len){

int k=str[i]-33;

while (now&&!nxt[now][k]) now=fail[now];

now=nxt[now][k];

if (now==-1) now=0;

int tmp=now;

while (tmp&&!ans[mark[tmp]]){

if (mark[tmp]){

ans[mark[tmp]]=1;

num++;

}

tmp=fail[tmp];

if (num>=3) return;

}

}

}

int T,i,j,n,m,total;

char s[maxn];

int main(){

while (~scanf("%d",&n)){

total=0;

init();

REP(i,n){

scanf("%s",s);

insert(s,i+1);

}

buildAC();

scanf("%d",&m);

REP(i,m){

scanf("%s",s);

match(s);

if (num==0) continue;

total++;

printf("web %d:",i+1);

REP(j,tot) if (ans[j]) printf(" %d",j);

puts("");

}

printf("total: %d\n",total);

}

}

后缀数组

**HDU6138,前缀+公共子串**

int wa[maxn],wb[maxn],wv[maxn],ws1[maxn];

int cmp(int \*r,int a,int b,int l){

return r[a]==r[b]&&r[a+l]==r[b+l];

}

//sa->pos(后缀排名->pos)

void da(int \*r,int \*sa,int n,int m){

r[n++]=0;//使rank从1开始(sa[0]=n)

int i,j,p,\*x=wa,\*y=wb,\*t;

REP(i,m) ws1[i]=0;//pre-cmp

REP(i,n) ws1[x[i]=r[i]]++;//r->x

rep(i,1,m) ws1[i]+=ws1[i-1];

rREP(i,n) sa[--ws1[x[i]]]=i;//sort(计数排序)

for (j=1,p=1;p<n;j<<=1,m=p){//j->2^x

p=0;rep(i,n-j,n) y[p++]=i;//最后j个是不用加(显然)

REP(i,n) if (sa[i]>=j) y[p++]=sa[i]-j;//后缀顺序

REP(i,n) wv[i]=x[y[i]];//x+y->wv(由于后缀顺序)

REP(i,m) ws1[i]=0;

REP(i,n) ws1[wv[i]]++;

rep(i,1,m) ws1[i]+=ws1[i-1];

rREP(i,n) sa[--ws1[wv[i]]]=y[i];//sort(计数排序)

t=x,x=y,y=t;

p=1;x[sa[0]]=0;

rep(i,1,n) x[sa[i]]=cmp(y,sa[i-1],sa[i],j)?p-1:p++;

}

}

int rnk[maxn],height[maxn];

void calheight(int \*r,int \*sa,int n){

int i,j,k=0;

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

REP(i,n){

if (k) k--;

j=sa[rnk[i]-1];

while (r[i+k]==r[j+k]) k++;

height[rnk[i]]=k;

}

}

int n,m;

int i,j,k;

char a[maxn];

int s[maxn];

int st[maxn];

int sa[maxn];

int id[maxn];

int val[maxn];

int tot,now,ans;

int main(){

int T;

scanf("%d",&T);

while (T--){

scanf("%d",&n);

tot=0;

FOR(i,1,n){

scanf("%s",a);

int len=strlen(a);

st[tot]=len;

REP(j,len) id[tot]=i,s[tot++]=a[j]-'a'+1;

s[tot++]='z'-'a'+i+1;

}

s[tot]=0;

da(s,sa,tot,26+n+1);

calheight(s,sa,tot);

now=0;

FOR(i,1,tot){

val[i]=max(val[i],now);

now=min(now,height[i+1]);

if (st[sa[i]]) now=max(now,height[i+1]),val[i]=INF;

}

now=0;//这里可以改成三个标记取min

rFOR(i,1,tot){

val[i]=max(val[i],now);

now=min(now,height[i]);

if (st[sa[i]]) now=max(now,height[i]),val[i]=max(val[i],st[sa[i]]);

}

char S[maxn];

REP(i,tot) S[i]=s[i]+'a'-1;S[tot]=0;

scanf("%d",&m);

REP(i,m){

int x,y,i;

scanf("%d%d",&x,&y);

now=0;

ans=0;

FOR(i,1,tot){

if (id[sa[i]]==x&&st[sa[i]]) now=max(now,st[sa[i]]);

if (id[sa[i]]==y) ans=max(ans,min(now,val[i]));

now=min(now,height[i+1]);

if (id[sa[i]]==x) now=max(now,height[i+1]);

}

now=0;

rFOR(i,1,tot){

if (id[sa[i]]==x&&st[sa[i]]) now=max(now,st[sa[i]]);

if (id[sa[i]]==y) ans=max(ans,min(now,val[i]));

now=min(now,height[i]);

if (id[sa[i]]==x) now=max(now,height[i]);

}

printf("%d\n",ans);

}

FOR(i,1,tot) val[i]=st[i]=0;

}

}

后缀自动机

int nxt[maxn][26],pre[maxn],len[maxn];

**//pre为上一个可以接受的位置 (树形结构,前缀相等,类似AC自动机fail指针),这样可以去除很多无用的边**

**//注意,pre的边不是所有的边!所以反过来求num的时候不能直接用pre,要REP(i,26),但是最长公共子串是要pre的**

int cnt,last;

void add(int c){

int np=++cnt,p=last;

len[np]=len[p]+1;

for (;p&&!nxt[p][c];p=pre[p]) nxt[p][c]=np;//边表示字符

if (!p) pre[np]=1;

else{

int q=nxt[p][c];

if (len[p]+1==len[q]) pre[np]=q;

else{

int nq=++cnt;len[nq]=len[p]+1;//new一个新节点(松弛(copy一遍))来保证结构稳定(或len相等)

memcpy(nxt[nq],nxt[q],sizeof(nxt[q]));

pre[nq]=pre[q];

pre[np]=pre[q]=nq;

for (;p&&nxt[p][c]==q;p=pre[p]) nxt[p][c]=nq;

}

}

last=np;

}

//void dfs(int x,int len){

// int i;

// printf("%s\n",a);

// REP(i,27){

// if (nxt[x][i]){

// a[len]=i+'a';

// dfs(nxt[x][i],len+1);

// a[len]=0;

// }

// }

//}

char a[maxn],b[maxn];

int F[maxn][10];

int n,m;

int i,j,k;

int ans,now,nowlen;

int T;

int S[maxn],K[maxn];

int main()

{

scanf("%s",a);

n=strlen(a);

last=++cnt;//1开始

REP(i,n) add(a[i]-'a');

T=0;

while (~scanf("%s",&b)){

T++;

m=strlen(b);

now=1;nowlen=0;

REP(i,m){

while (now&&!nxt[now][b[i]-'a']) now=pre[now],nowlen=len[now];

if (!now) now=1,nowlen=0;

if (nxt[now][b[i]-'a']){

now=nxt[now][b[i]-'a'];

nowlen++;

}

F[now][T]=max(nowlen,F[now][T]);

}

}

FOR(i,1,cnt) S[len[i]]++;

FOR(i,1,n) S[i]+=S[i-1];

FOR(i,1,cnt) K[S[len[i]]--]=i;

rFOR(i,1,cnt){

FOR(j,1,T) F[pre[K[i]]][j]=max(F[pre[K[i]]][j],min(F[K[i]][j],len[pre[K[i]]]));

}

FOR(i,1,cnt){

int mx=INF;

FOR(j,1,T) mx=min(mx,F[i][j]);

ans=max(ans,mx);

}

printf("%d\n",ans);

}

后缀自动机+主席树合并

**//查询某串部分在串l->r的最大出现次数及位置**

**//SAM**

int nxt[maxn][27],pre[maxn],len[maxn];

int CNT,last;

void add(int c){

int np=++CNT,p=last;

len[np]=len[p]+1;

for (;p&&!nxt[p][c];p=pre[p]) nxt[p][c]=np;

if (!p) pre[np]=1;

else{

int q=nxt[p][c];

if (len[p]+1==len[q]) pre[np]=q;

else{

int nq=++CNT;len[nq]=len[p]+1;

memcpy(nxt[nq],nxt[q],sizeof(nxt[q]));

pre[nq]=pre[q];

pre[np]=pre[q]=nq;

for (;p&&nxt[p][c]==q;p=pre[p]) nxt[p][c]=nq;

}

}

last=np;

}

//char A[maxn];

//void dfs(int x,int len){//check

// int i;

// printf("%s\n",A);

// REP(i,26){

// if (nxt[x][i]){

// A[len]=i+'a';

// dfs(nxt[x][i],len+1);

// A[len]=0;

// }

// }

//}

**//segtree**

int cnt;

struct node{

pair<int,int> val;//bigger

int l,r;

}tree[maxn\*25];

int root[maxn];

inline pair<int,int> add(pair<int,int> A,pair<int,int> B){

return make\_pair(A.first+B.first,A.second);

}

inline pair<int,int> better(pair<int,int> A,pair<int,int> B){

if (A.first==B.first) return A.second<B.second?A:B;

return A.first>B.first?A:B;

}

inline void insert(int &x,int val,int l,int r){

if (!x) x=++cnt;

if (l==r){

tree[x].val.first++;

tree[x].val.second=l;

return;

}

int mid=(l+r)/2;

if (val<=mid) insert(tree[x].l,val,l,mid);

else insert(tree[x].r,val,mid+1,r);

tree[x].val=better(tree[tree[x].l].val,tree[tree[x].r].val);

}

inline int Merge(int x,int y,int l,int r){

if (!x||!y) return x|y;

int z=++cnt;

if (l==r){

tree[z].val=add(tree[x].val,tree[y].val);

return z;

}

int mid=(l+r)/2;

tree[z].l=Merge(tree[x].l,tree[y].l,l,mid);

tree[z].r=Merge(tree[x].r,tree[y].r,mid+1,r);

tree[z].val=better(tree[tree[z].l].val,tree[tree[z].r].val);

return z;

}

inline pair<int,int> query(int x,int l,int r,int L,int R){

if (!x) return make\_pair(0,0);

if (l<=L&&R<=r) return tree[x].val;

int mid=(L+R)/2;

pair<int,int> ret=make\_pair(0,0);

if (mid>=l) ret=better(ret,query(tree[x].l,l,r,L,mid));

if (r>mid) ret=better(ret,query(tree[x].r,l,r,mid+1,R));

return ret;

}

int father[21][maxn],pos[maxn];//倍增求father

inline int getfather(int l,int r){

int L=(r-l+1),ret=pos[r],i;

rFOR(i,0,20) if (len[father[i][ret]]>=L) ret=father[i][ret];

return ret;

}

int n,m,q;

int i,j,k;

char s[maxn];

int S[maxn],K[maxn];

int main(){

scanf("%s",s);

last=++CNT;

n=strlen(s);

REP(i,n) add(s[i]-'a'),pos[i+1]=last;

add(26);

scanf("%d",&m);

FOR(k,1,m){

scanf("%s",s);

n=strlen(s);

REP(i,n) add(s[i]-'a'),insert(root[last],k,1,m);

add(26);

}

FOR(i,1,CNT) S[len[i]]++;

FOR(i,1,CNT) S[i]+=S[i-1];

FOR(i,1,CNT) K[S[len[i]]--]=i;

rFOR(i,1,CNT){

if (pre[K[i]]) root[pre[K[i]]]=Merge(root[pre[K[i]]],root[K[i]],1,m);

}

FOR(i,1,CNT) father[0][i]=pre[i];

FOR(j,1,20)

FOR(i,1,CNT) father[j][i]=father[j-1][father[j-1][i]];//倍增

scanf("%d",&q);

while (q--){

int l,r,pl,pr;

scanf("%d%d%d%d",&l,&r,&pl,&pr);

int x=getfather(pl,pr);

pair<int,int> ans=query(root[x],l,r,1,m);

if (ans.first==0) printf("%d 0\n",l);

else printf("%d %d\n",ans.second,ans.first);

}

}

马拉车

**//p是每个点为中心的延伸最长回文子串长度，-1就是原串以这个点为中心的长度**

**//看到题先去想这种方法，再说其他方法**

int n,m;

char s[maxn],str[maxn];

int len1,len2,p[maxn],ans;

void init(){

ans=0;

int i;

str[0]='+';

str[1]='%';

REP(i,len1+1){

str[i\*2+2]=s[i];

str[i\*2+3]='%';

}

len2=len1\*2+2;

// printf("%s",str);

}

void manacher(){//主要是说已经对称匹配过的不用再进行

int id=0,mx=0;

int i;

FOR(i,1,len2-1){

if (mx>i) p[i]=min(p[2\*id-i],mx-i);

else p[i]=1;

while (str[i+p[i]]==str[i-p[i]]) p[i]++;

if (p[i]+i>mx){

mx=p[i]+i;

id=i;

}

}

}

**//滚动的最长回文子串**

int a[maxn];

struct node{

int left,right;

}tree[maxn\*4\*8];

int val[maxn\*4\*8],lazy[maxn\*4\*8];

void change(int x,int i){

val[x]=max(val[x],i);

lazy[x]=max(lazy[x],i);

}

void pushdown(int x){

if (lazy[x]){

change(x<<1,lazy[x]);

change(x<<1|1,lazy[x]);

lazy[x]=0;

}

}

void build(int x,int l,int r){

tree[x].left=l;tree[x].right=r;

val[x]=lazy[x]=0;

if (l==r) return;

int mid=(l+r)/2;

build(x<<1,l,mid);

build(x<<1|1,mid+1,r);

}

void update(int x,int l,int r,LL val){

int L=tree[x].left,R=tree[x].right;

if (l<=L&&R<=r){

change(x,val);

return;

}

pushdown(x);

int mid=(L+R)/2;

if (mid>=l) update(x<<1,l,r,val);

if (r>mid) update(x<<1|1,l,r,val);

}

int query(int x,int pos){

int L=tree[x].left,R=tree[x].right;

if (L==R) return val[x];

pushdown(x);

int mid=(L+R)/2;

if (mid>=pos) return query(x<<1,pos);

return query(x<<1|1,pos);

}

int n,m;

char s[maxn\*2],str[maxn\*4];

int len1,len2,p[maxn\*8];

//p是每个点为中心的延伸最长回文子串长度，-1就是原串以这个点为中心的长度

int i,j,k;

int del1[maxn\*8],del2[maxn\*8];

int ans[maxn\*8];

int main(){

scanf("%d",&n);

scanf("%s",s);

rep(i,n,n\*2) s[i]=s[i-n];

//init();

int i;

len1=strlen(s);

str[0]='+';str[1]='%';

REP(i,len1+1){

str[i\*2+2]=s[i];

str[i\*2+3]='%';

}

len2=len1\*2+2;

//manacher();

int id=0,mx=0;

FOR(i,1,len2-1){

if (mx>i) p[i]=min(p[2\*id-i],mx-i);

else p[i]=1;

while (str[i+p[i]]==str[i-p[i]]) p[i]++;

if (p[i]+i>mx){

mx=p[i]+i;

id=i;

}

}

REP(i,len2) p[i]--;//manacher

//solve

REP(i,len2) {

if ((p[i]&1)==(n&1)) p[i]=min(p[i],n);

else p[i]=min(p[i],n-1);

}

build(1,1,len2\*2);

REP(i,len2){

del1[i-p[i]]=max(del1[i-p[i]],p[i]);

if (i+p[i]-n\*2>=0) del2[i+p[i]-n\*2]=max(del2[i+p[i]-n\*2],p[i]);

if (i+p[i]-n\*2<i-p[i]&&i-p[i]>0){

update(1,max(0,i+p[i]-n\*2)+1,max(0,i-p[i])+1,p[i]);

}

}

mx=0;

REP(i,len2){

if (str[i]!='%'&&str[i]!='+') mx-=2;

mx=max(mx,del1[i]);

ans[i]=max(ans[i],mx);

}

mx=0;

rREP(i,len2\*2){

if (str[i]!='%'&&str[i]!='+') mx-=2;

mx=max(mx,del2[i]);

ans[i]=max(ans[i],mx);

}

REP(i,len2) ans[i]=max(ans[i],query(1,i+1));

REP(i,n) printf("%d\n",max(ans[i\*2+1],ans[i\*2+2]));

}

回文自动机

**//两串相同回文子串**

struct Ptree{

int next[maxn][27];

int fail[maxn];

int cnt[maxn];//真正个数

// int num[maxn];//右端点结尾的maxnum

int len[maxn];//长度

int S[maxn];//字符

int last;//上一个字符节点

int n,tot;//n表示字符位置

int newnode(int l){

memset(next[tot],0,sizeof(next[tot]));

cnt[tot]=0;

// num[tot]=0;

len[tot]=l;//不是1...

return tot++;

}

void init(){

tot=0;

newnode(0);

newnode(-1);

last=n=0;

S[n]=-1;//减少特判

fail[0]=1;

}

int getfail(int x){

while(S[n-len[x]-1]!=S[n]) x=fail[x];

return x;

}

void add(int c){

c-='a';

S[++n]=c;

int cur=getfail(last);

if (!next[cur][c]){

int now=newnode(len[cur]+2);

fail[now]=next[getfail(fail[cur])][c];

next[cur][c]=now;

// num[now]=num[fail[now]]+1;

}

last=next[cur][c];

cnt[last]++;

}

void count(){//count完才对

int i;

rREP(i,tot) cnt[fail[i]]+=cnt[i];

}

}T1,T2;

LL ans;

void dfs(int x,int y){

int i;

REP(i,27){

int u=T1.next[x][i],v=T2.next[y][i];

if (u&&v){

ans+=1ll\*T1.cnt[u]\*T2.cnt[v];

dfs(u,v);

}

}

}

char a[maxn],b[maxn];

void solve(){

scanf("%s%s",a,b);

int len1=strlen(a),len2=strlen(b);

int i,j;

T1.init();T2.init();

REP(i,len1) T1.add(a[i]);

REP(j,len2) T2.add(b[j]);

T1.count();

T2.count();

dfs(0,0);

dfs(1,1);

}

int main(){

int T,x=0;

scanf("%d",&T);

while (T--) {

ans=0;

solve();

printf("Case #%d: %lld\n",++x,ans);

}

}

# 数据结构

按秩合并并查集(+整体二分)

//求删去每个点后图是否存在奇环(主要是整体二分思想)

typedef pair<int,int> pii;

#define fi first

#define se second

#define mp make\_pair

vector<pii> E[maxn<<2],have[maxn<<2],back[maxn<<2];//防爆栈

int fa[maxn],val[maxn];

pii getfa(int x){

int ret=x,color=val[ret];

while (fa[ret]!=ret) ret=fa[ret],color^=val[ret];

return mp(ret,color);

}

int sz[maxn];

int ans[maxn];

void solve(int X,int l,int r){

bool flag=0;

int i;

int mid=(l+r)/2;

for(pii e:have[X]){

pii x=getfa(e.fi);

pii y=getfa(e.se);

if (x.fi==y.fi){

if (x.se==y.se){

flag=1;

break;

}

}else{

if (sz[x.fi]>sz[y.fi]) swap(x,y);

back[X].push\_back(mp(x.fi,x.se^y.se));

fa[x.fi]=y.fi;

sz[y.fi]+=sz[x.fi];

val[x.fi]^=x.se^y.se;

}

}

if (flag){

FOR(i,l,r) ans[i]=0;

}else if (l<r){

int mid=(l+r)/2;

for (pii e:E[X]){

if ((l<=e.fi&&e.fi<=mid)||(l<=e.se&&e.se<=mid)) E[X<<1].push\_back(e);

else have[X<<1].push\_back(e);

if ((mid+1<=e.fi&&e.fi<=r)||(mid+1<=e.se&&e.se<=r)) E[X<<1|1].push\_back(e);

else have[X<<1|1].push\_back(e);

}

solve(X<<1,l,mid);

solve(X<<1|1,mid+1,r);

}

for (pii u:back[X]){

sz[fa[u.fi]]-=sz[u.fi];

fa[u.fi]=u.fi;

val[u.fi]^=u.se;

}

vector<pii>().swap(E[X]);

vector<pii>().swap(have[X]);

vector<pii>().swap(back[X]);

}

int n,m;

int i;

int main()

{

int T;

scanf("%d",&T);

while (T--){

scanf("%d%d",&n,&m);

FOR(i,1,n) fa[i]=i,sz[i]=1,ans[i]=1,val[i]=1;

FOR(i,1,m){

int u,v;

scanf("%d%d",&u,&v);

if (u>v) swap(u,v);

E[1].push\_back(make\_pair(u,v));

}

solve(1,1,n);

FOR(i,1,n) printf("%d",ans[i]);puts("");

}

}

二维树状数组

**//poj2155,修改区间01,query单点01,差分来做**

int n,m;

int c[maxn][maxn];

int lowbit(int x){return x&-x;}

void update(int \_x,int \_y){

for (int x=\_x;x<=n;x+=lowbit(x))

for (int y=\_y;y<=n;y+=lowbit(y)) c[x][y]^=1;

}

int sum(int \_x,int \_y){

int ret=0;

for (int x=\_x;x;x-=lowbit(x))

for (int y=\_y;y;y-=lowbit(y)) ret^=c[x][y];

return ret;

}

int T;

char s[10];

int i,j,k;

int x1,x2,y1,y2;

int main()

{

scanf("%d",&T);

while (T--){

scanf("%d%d",&n,&m);

FOR(i,1,n) FOR(j,1,n) c[i][j]=0;

REP(i,m){

scanf("%s",s);

if (s[0]=='C'){

scanf("%d%d%d%d",&x1,&y1,&x2,&y2);

update(x1,y1);update(x2+1,y2+1);

update(x1,y2+1);update(x2+1,y1);

}else{

scanf("%d%d",&x1,&y1);

printf("%d\n",sum(x1,y1));

}

}puts("");

}

}

树状数组 不大于k的最大值

int a[maxn];

int n,i,j;

const int nn=1000000;

inline int lowbit(int x){

return x&-x;

}

inline void insert(int x){

while (x<=nn){

a[x]++;

x+=lowbit(x);

}

}

inline int find(int x){

while (x&&!a[x]) x^=lowbit(x);

if (!x) return 0;

int t=lowbit(x)>>1,y=a[x];

while (t){

if (y-a[x-t]) y-=a[x-t];

else{y=a[x-t];x=x-t;}

t>>=1;

}return x;

}

int ans;

const int MOD=19260817;

int main()

{

while(~scanf("%d",&n))

{

ans=0;

FOR(i,1,1000000) a[i]=0;

REP(i,n){

scanf("%d",&j);

if (j==0) continue;

ans=ans+find(j);

// printf("%d ",find(j));

insert(j);

ans%=MOD;

}

printf("%d\n",ans);

}

}

二维线段树

**//单点修改区间查询min,max**

struct node{

int left,right;

}treeX[maxn\*4],treeY[maxn\*4];

int a[maxn\*4][maxn\*4];

int mx[maxn\*4][maxn\*4],mn[maxn\*4][maxn\*4];

void buildY(int x,int y,int yl,int yr){

treeY[y].left=yl,treeY[y].right=yr;

if (yl==yr){

if (treeX[x].left==treeX[x].right)

mx[x][y]=mn[x][y]=a[treeX[x].left][yl];

else{

mx[x][y]=max(mx[x<<1][y],mx[x<<1|1][y]);

mn[x][y]=min(mn[x<<1][y],mn[x<<1|1][y]);

}

return;

}

int mid=(yl+yr)/2;

buildY(x,y<<1,yl,mid);

buildY(x,y<<1|1,mid+1,yr);

mx[x][y]=max(mx[x][y<<1],mx[x][y<<1|1]);

mn[x][y]=min(mn[x][y<<1],mn[x][y<<1|1]);

}

void buildX(int x,int n,int xl,int xr){

treeX[x].left=xl,treeX[x].right=xr;

if (xl==xr){

buildY(x,1,1,n);

return;

}

int mid=(xl+xr)/2;

buildX(x<<1,n,xl,mid);

buildX(x<<1|1,n,mid+1,xr);

buildY(x,1,1,n);

}

int querymaxY(int x,int y,int yl,int yr){

int L=treeY[y].left,R=treeY[y].right;

if (yl<=L&&R<=yr){

return mx[x][y];

}

int mid=(L+R)/2,ret=0;

if (mid>=yl) ret=max(ret,querymaxY(x,y<<1,yl,yr));

if (yr>mid) ret=max(ret,querymaxY(x,y<<1|1,yl,yr));

return ret;

}

int querymaxX(int x,int xl,int xr,int yl,int yr){

int L=treeX[x].left,R=treeX[x].right;

if (xl<=L&&R<=xr){

return querymaxY(x,1,yl,yr);

}

int mid=(L+R)/2,ret=0;

if (mid>=xl) ret=max(ret,querymaxX(x<<1,xl,xr,yl,yr));

if (xr>mid) ret=max(ret,querymaxX(x<<1|1,xl,xr,yl,yr));

return ret;

}

int queryminY(int x,int y,int yl,int yr){

int L=treeY[y].left,R=treeY[y].right;

if (yl<=L&&R<=yr){

return mn[x][y];

}

int mid=(L+R)/2,ret=INF;

if (mid>=yl) ret=min(ret,queryminY(x,y<<1,yl,yr));

if (yr>mid) ret=min(ret,queryminY(x,y<<1|1,yl,yr));

return ret;

}

int queryminX(int x,int xl,int xr,int yl,int yr){

int L=treeX[x].left,R=treeX[x].right;

if (xl<=L&&R<=xr){

return queryminY(x,1,yl,yr);

}

int mid=(L+R)/2,ret=INF;

if (mid>=xl) ret=min(ret,queryminX(x<<1,xl,xr,yl,yr));

if (xr>mid) ret=min(ret,queryminX(x<<1|1,xl,xr,yl,yr));

return ret;

}

void updateY(int x,int y,int posy,int val){

int L=treeY[y].left,R=treeY[y].right;

if (L==R){

if (treeX[x].left==treeX[x].right)

mx[x][y]=mn[x][y]=val;

else{

mx[x][y]=max(mx[x<<1][y],mx[x<<1|1][y]);

mn[x][y]=min(mn[x<<1][y],mn[x<<1|1][y]);

}

return;

}

int mid=(L+R)/2;

if (mid>=posy) updateY(x,y<<1,posy,val);

else updateY(x,y<<1|1,posy,val);

mx[x][y]=max(mx[x][y<<1],mx[x][y<<1|1]);

mn[x][y]=min(mn[x][y<<1],mn[x][y<<1|1]);

}

void updateX(int x,int posx,int posy,int val){

int L=treeX[x].left,R=treeX[x].right;

if (L==R){

updateY(x,1,posy,val);

return;

}

int mid=(L+R)/2;

if (mid>=posx) updateX(x<<1,posx,posy,val);

else updateX(x<<1|1,posx,posy,val);

updateY(x,1,posy,val);

}

int n,m,q;

int i,j;

int ans;

int main(){

int T,x=0;

scanf("%d",&T);

while (T--){

scanf("%d",&n);

FOR(i,1,n)

FOR(j,1,n) scanf("%d",&a[i][j]);

buildX(1,n,1,n);

scanf("%d",&q);

printf("Case #%d:\n",++x);

while (q--){

int x,y,r;

scanf("%d%d%d",&x,&y,&r);

r/=2;

int xl=max(1,x-r),xr=min(n,x+r),yl=max(1,y-r),yr=min(n,y+r);

int MX=querymaxX(1,xl,xr,yl,yr),MN=queryminX(1,xl,xr,yl,yr);

updateX(1,x,y,(MX+MN)/2);

printf("%d\n",(MX+MN)/2);

}

}

}

扫描线 矩形周长并

int size;

int len[maxn\*2];

int n,m;

int i,j,k;

struct Seg{

struct node{

int left,right;

int len,num;

bool cl,cr;//iff

int lazy;

void update(int x){

lazy+=x;

}

}tree[maxn\*4];

void pushup(int x){

if (tree[x].lazy){

tree[x].len=len[tree[x].right+1]-len[tree[x].left];

tree[x].cl=tree[x].cr=1;tree[x].num=2;

}else if (tree[x].left==tree[x].right){

tree[x].len=0;

tree[x].cl=tree[x].cr=0;tree[x].num=0;

}else{

tree[x].len=tree[x<<1].len+tree[x<<1|1].len;

tree[x].num=tree[x<<1].num+tree[x<<1|1].num;

if (tree[x<<1].cr&&tree[x<<1|1].cl) tree[x].num-=2;

tree[x].cl=tree[x<<1].cl;

tree[x].cr=tree[x<<1|1].cr;

}

};

void build(int x,int l,int r){

tree[x].left=l;tree[x].right=r;

tree[x].len=tree[x].lazy=0;

if (l==r){

}else{

int mid=(l+r)/2;

build(x<<1,l,mid);

build(x<<1|1,mid+1,r);

pushup(x);

}

}

void update(int x,int l,int r,LL val){

int L=tree[x].left,R=tree[x].right;

if (l<=L&&R<=r){

tree[x].update(val);

pushup(x);

}else{

int mid=(L+R)/2;

if (mid>=l) update(x<<1,l,r,val);

if (r>mid) update(x<<1|1,l,r,val);

pushup(x);

}

}

int query(int x,int l,int r){//num

int L=tree[x].left,R=tree[x].right;

if (l<=L&&R<=r){

return tree[x].len;

}else{

int mid=(L+R)/2;

int ans;

if (mid>=l) ans+=query(x<<1,l,r);

if (r>mid) ans+=query(x<<1|1,l,r);

pushup(x);

return ans;

}

}

}T;

struct point{

int x1,x2,h;

int n;

bool operator <(const point&a)const{

if (h!=a.h) return h<a.h;

return n>a.n;

}

}a[maxn];

map<int,int> hash;

int x1,x2,y1,y2;

int ans;

int len1,len2,num;

int main()

{

int TT=0;

while (~scanf("%d",&n)){

if (n==0) break;

FOR(i,1,n){

scanf("%d%d%d%d",&x1,&y1,&x2,&y2);

len[i\*2-1]=x1; len[i\*2]=x2;

a[i\*2-1].x1=x1;a[i\*2-1].x2=x2;

a[i\*2-1].n=1; a[i\*2-1].h=y1;

a[i\*2].x1=x1;a[i\*2].x2=x2;

a[i\*2].n=-1; a[i\*2].h=y2;

}

sort(a+1,a+n\*2+1);

sort(len+1,len+n\*2+1);

hash.clear();

FOR(i,1,2\*n) hash[len[i]]=i;

T.build(1,1,n\*2);

ans=0;

FOR(i,1,2\*n){

len1=T.tree[1].len;num=T.tree[1].num;

T.update(1,hash[a[i].x1],hash[a[i].x2]-1,a[i].n);

len2=T.tree[1].len;

ans+=abs(len2-len1);

ans+=num\*(a[i].h-a[i-1].h);

}

printf("%d\n",ans);

}

}

主席树

**//静态区间第k大**

vector<int> v;//学到的hash方法

int getid(int x){return lower\_bound(v.begin(),v.end(),x)-v.begin()+1;}

int root[maxn],a[maxn],cnt;

struct Tnode{

int left,right,sum;

}T[maxn\*40];

void update(int l,int r,int &x,int y,int pos){

T[++cnt]=T[y];T[cnt].sum++;x=cnt;

if (l==r) return;

int mid=(l+r)/2;

if (mid>=pos) update(l,mid,T[x].left,T[y].left,pos);

else update(mid+1,r,T[x].right,T[y].right,pos);

}

int query(int l,int r,int x,int y,int k){

if (l==r) return l;

int mid=(l+r)/2;

int sum=T[T[y].left].sum-T[T[x].left].sum;

if (sum>=k) return query(l,mid,T[x].left,T[y].left,k);

else return query(mid+1,r,T[x].right,T[y].right,k-sum);

}

int n,m;

int i,j,k,ii;

int main()

{

scanf("%d%d",&n,&m);

FOR(i,1,n) scanf("%d",&a[i]),v.push\_back(a[i]);

sort(v.begin(),v.end());v.erase(unique(v.begin(),v.end()),v.end());

FOR(i,1,n) update(1,n,root[i],root[i-1],getid(a[i]));

REP(ii,m){

scanf("%d%d%d",&i,&j,&k);

printf("%d\n",v[query(1,n,root[i-1],root[j],k)-1]);

}

return 0;

}

区间不重复数字个数和第k个是哪位

int cnt;

struct node{

int l,r,sum;

}T[maxn\*40];

void update(int l,int r,int &x,int y,int pos,int v){

T[++cnt]=T[y],T[cnt].sum+=v,x=cnt;

if (l==r) return;

int mid=(l+r)/2;

if (mid>=pos) update(l,mid,T[x].l,T[y].l,pos,v);

else update(mid+1,r,T[x].r,T[y].r,pos,v);

}

int findsum(int l,int r,int x,int L,int R){

**//每个点记录的都是这个点往后的相同数(前面把后面短路了)**

if (L<=l&&r<=R) return T[x].sum;

int mid=(l+r)/2;

int sum=0;

if (mid>=L) sum+=findsum(l,mid,T[x].l,L,R);

if (R>mid) sum+=findsum(mid+1,r,T[x].r,L,R);

return sum;

}

int query(int l,int r,int x,int k){

if (l==r) return l;

int mid=(l+r)/2;

int sum=T[T[x].l].sum;

if (sum>=k) return query(l,mid,T[x].l,k);

else return query(mid+1,r,T[x].r,k-sum);

}

int n,m;

int i,j,k,pos;

int t,TT;

int ans[maxn],a[maxn];

int last[maxn],root[maxn];

int main()

{

scanf("%d",&TT);

FOR(t,1,TT){

scanf("%d%d",&n,&m);

FOR(i,1,n) scanf("%d",&a[i]);

FOR(i,1,n) last[a[i]]=0,root[i]=0;

cnt=0;

rFOR(i,1,n){

if (!last[a[i]]) update(1,n,root[i],root[i+1],i,1);

else {

update(1,n,root[i],root[i+1],last[a[i]],-1);

update(1,n,root[i],root[i],i,1);

}

last[a[i]]=i;

}

FOR(i,1,m){

scanf("%d%d",&j,&k);

j=(j+ans[i-1])%n+1;

k=(k+ans[i-1])%n+1;

if (j>k) swap(j,k);

pos=(findsum(1,n,root[j],j,k)+1)/2;

ans[i]=query(1,n,root[j],pos);

}

printf("Case #%d:",t);

FOR(i,1,m) printf(" %d",ans[i]);

puts("");

}

return 0;

}

可持久化数组(主席树维护)

struct Tnode{

int left,right,val;

}T[maxn\*80];

int cnt=0;

void build(int &x,int l,int r){

if (!x) x=++cnt;

if (l==r) {T[x].val=l; return;}

int mid=(l+r)/2;

build(T[x].left,l,mid);

build(T[x].right,mid+1,r);

}

void update(int &x,int y,int pos,int val,int l,int r){

T[++cnt]=T[y];x=cnt;

if (l==r) {T[x].val=val; return;}

int mid=(l+r)/2;

if (mid>=pos) update(T[x].left,T[y].left,pos,val,l,mid);

else update(T[x].right,T[y].right,pos,val,mid+1,r);

}

int query(int x,int pos,int l,int r){

if (l==r) return T[x].val;

int mid=(l+r)/2;

if (mid>=pos) return query(T[x].left,pos,l,mid);

else return query(T[x].right,pos,mid+1,r);

}

int root[maxn];

int n,m;

int i,j,k,t;

int a,b,ans;

inline int getfather(int x){

int t=query(root[i],x,1,n);

if (t==x) return x;

int fa=getfather(t);

update(root[i],root[i],x,fa,1,n);

return fa;

}

int main()

{

scanf("%d%d",&n,&m);

build(root[0],1,n);

FOR(i,1,m){

scanf("%d",&k);

root[i]=root[i-1];

if (k==1){

scanf("%d%d",&a,&b);

a^=ans;b^=ans;

int x=getfather(a),y=getfather(b);

if (x==y) continue;

update(root[i],root[i],x,y,1,n);

}else if (k==2){

scanf("%d",&t);

t^=ans;

root[i]=root[t];

}else{

scanf("%d%d",&a,&b);

int x=getfather(a),y=getfather(b);

a^=ans;b^=ans;

if (x==y) puts("1"),ans=1;

else puts("0"),ans=0;

}

}

return 0;

}

树套树

**// zoj2112动态第k大(这个是类似kuangbin大佬的做法按点建树，我按权值多个log...)**

struct node{

int l,r,cnt;

node(){l=r=cnt=0;}

}T[2500010];

int cnt;

int SIZE;

inline int lowbit(int x){

return x&(-x);

}

void Update(int &x,int y,int l,int r,int pos,int val){

T[++cnt]=T[y];T[cnt].cnt+=val;x=cnt;

if (l==r) return;

int mid=(l+r)/2;

if (mid>=pos) Update(T[x].l,T[y].l,l,mid,pos,val);

else Update(T[x].r,T[y].r,mid+1,r,pos,val);

}

int n,m;

int root[maxn];

void update(int x,int pos,int val){

while (x<=n){

Update(root[x],root[x],1,SIZE,pos,val);

x+=lowbit(x);

}

}

int ROOT[maxn];

int useL[maxn],useR[maxn];//现在的l/r

int Query(int l,int r,int L,int R,int pos,int pre\_L,int pre\_R){//颜色,pos L->R

if (l==r) return l;

int x;

int mid=(l+r)/2,nowcnt=0;

for(x=L-1;x;x-=lowbit(x)) nowcnt-=T[T[useL[x]].l].cnt;

for(x=R;x;x-=lowbit(x)) nowcnt+=T[T[useR[x]].l].cnt;

nowcnt+=T[T[pre\_R].l].cnt-T[T[pre\_L].l].cnt;

if (nowcnt>=pos){

for(x=L-1;x;x-=lowbit(x)) useL[x]=T[useL[x]].l;

for(x=R;x;x-=lowbit(x)) useR[x]=T[useR[x]].l;

return Query(l,mid,L,R,pos,T[pre\_L].l,T[pre\_R].l);

}else{

for(x=L-1;x;x-=lowbit(x)) useL[x]=T[useL[x]].r;

for(x=R;x;x-=lowbit(x)) useR[x]=T[useR[x]].r;

return Query(mid+1,r,L,R,pos-nowcnt,T[pre\_L].r,T[pre\_R].r);

}

}

int query(int L,int R,int pos){

int x;

for(x=L-1;x;x-=lowbit(x)) useL[x]=root[x];

for(x=R;x;x-=lowbit(x)) useR[x]=root[x];

return Query(1,SIZE,L,R,pos,ROOT[L-1],ROOT[R]);

}

char K[maxn],Q[20];

int A[maxn][4];

int a[maxn];

vector<int> H;

inline int getid(int x){return lower\_bound(H.begin(),H.end(),x)-H.begin()+1;}

void solve(){

scanf("%d%d",&n,&m);

int i;

FOR(i,1,n) scanf("%d",&a[i]),H.push\_back(a[i]);

REP(i,m){

scanf("%s",Q);

K[i]=Q[0];

if (K[i]=='Q') scanf("%d%d%d",&A[i][0],&A[i][1],&A[i][2]);

if (K[i]=='C') scanf("%d%d",&A[i][0],&A[i][1]),H.push\_back(A[i][1]);

}

sort(H.begin(),H.end());H.erase(unique(H.begin(),H.end()),H.end());

SIZE=H.size();

cnt=0;

FOR(i,1,n) Update(ROOT[i],ROOT[i-1],1,SIZE,getid(a[i]),1);

REP(i,m){

if (K[i]=='Q') printf("%d\n",H[query(A[i][0],A[i][1],A[i][2])-1]);//l,r,pos

if (K[i]=='C'){

update(A[i][0],getid(a[A[i][0]]),-1);

a[A[i][0]]=A[i][1];

update(A[i][0],getid(A[i][1]),1);

}

}

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

FOR(i,1,cnt) T[i]=node();

vector<int>().swap(H);

}

int main(){

T[0].cnt=T[0].l=T[0].r=0;

int T\_T;

scanf("%d",&T\_T);

while (T\_T--) solve();

}

CDQ分治(套线段树)

**// CF848C CDQ分治（区间数字出现的r-l之和）**

**//将所有操作计算成为add和del,然后solve(l,r),再去除影响**

struct node{

int pos,val,t,i;

node(int \_pos=0,int \_val=0,int \_t=0,int \_i=0):pos(\_pos),val(\_val),t(\_t),i(\_i){};

}a[maxn\*7],p[maxn\*7];

int n,m;

LL sum[maxn];

inline int lowbit(int x){

return x&-x;

}

void update(int x,int val){

while (x<=n){

sum[x]+=val;

x+=lowbit(x);

}

}

LL query(int x){

LL ret=0;

while (x){

ret+=sum[x];

x-=lowbit(x);

}

return ret;

}

LL ans[maxn];

void solve(int l,int r){

if (l==r) return;

int mid=(l+r)/2;

solve(l,mid);

solve(mid+1,r);

int t1=l,t2=mid+1,t=l,i;

while (t1<=mid||t2<=r){

if (t2>r||(t1<=mid&&a[t1].t<=a[t2].t)){

node &now=p[t++]=a[t1++];

if (now.i) continue;

update(now.pos,now.val);//每一次修正一些

}else{

node &now=p[t++]=a[t2++];

if (!(now.i)) continue;

ans[now.i]+=query(now.t)-query(now.pos-1);

}

}

FOR(i,l,mid) if (a[i].t) update(a[i].pos,-a[i].val);

FOR(i,l,r) a[i]=p[i];

}

int all;

set<int> S[maxn];

void ins(int pos,int val){

S[val].insert(pos);

set<int>::iterator it=S[val].find(pos),itt=it;itt++;

int pre=0,suf=0;

if (it!=S[val].begin()) it--,pre=\*it;

if (itt!=S[val].end()) suf=\*itt;

if (pre) a[++all]=node(pre,pos-pre,pos,0);

if (suf) a[++all]=node(pos,suf-pos,suf,0);

if (pre&&suf) a[++all]=node(pre,pre-suf,suf,0);

}

void del(int pos,int val){

set<int>::iterator it=S[val].find(pos),itt=it;itt++;

int pre=0,suf=0;

if (it!=S[val].begin()) it--,pre=\*it;

if (itt!=S[val].end()) suf=\*itt;

if (pre) a[++all]=node(pre,-(pos-pre),pos,0);

if (suf) a[++all]=node(pos,-(suf-pos),suf,0);

if (pre&&suf) a[++all]=node(pre,-(pre-suf),suf,0);

S[val].erase(pos);

}

int val[maxn];

int i;

int main(){

scanf("%d%d",&n,&m);

FOR(i,1,n){

scanf("%d",&val[i]);

ins(i,val[i]);

}

FOR(i,1,m){

int k,l,r;

scanf("%d%d%d",&k,&l,&r);

if (k==1){

del(l,val[l]);

val[l]=r;

ins(l,val[l]);

ans[i]=-1;

}else a[++all]=node(l,0,r,i);

}

solve(1,all);

FOR(i,1,m) if (~ans[i]) printf("%I64d\n",ans[i]);

}

决策单调性优化+CDQ分治(+类似莫队)

**//我的理解:从左往右来看,如果l++,那么切的点只会向右移动,xl,xr是指转折点可能出现的位置;**

**//CDQ分治,传递下去了解可能存在的区间**

**//每次更新的是mid节点**

**//bfs,dfs均可,时间均为log(莫队不影响,莫队时间可证明nlogn)**

**//CF868F题意:切区间k段,每段数字出现个数sigma{n(n-1)/2}最小的个数**

struct node{

int l,r,xl,xr;

};

int n,m;

int a[maxn];

LL pre[maxn],dp[maxn],sum;

int cnt[maxn];

int \_l,\_r;

queue<node> Q;

void solve(){

int i;

Q.push(node{1,n,1,n});

while (Q.size()){

node F=Q.front();Q.pop();

int l=F.l,r=F.r,L=F.xl,R=F.xr;

int m=(l+r)/2,M=L;

LL &now=dp[m];

while (\_r<m) \_r++,sum+=cnt[a[\_r]],cnt[a[\_r]]++;

while (\_l>L) \_l--,sum+=cnt[a[\_l]],cnt[a[\_l]]++;

while (\_l<L) cnt[a[\_l]]--,sum-=cnt[a[\_l]],\_l++;

while (\_r>m) cnt[a[\_r]]--,sum-=cnt[a[\_r]],\_r--;

FOR(i,L,min(m,R)){

while (\_l<i) cnt[a[\_l]]--,sum-=cnt[a[\_l]],\_l++;

if (now>sum+pre[i-1]) now=sum+pre[i-1],M=i;

}

if (l<m) Q.push(node{l,m-1,L,M});

if (r>m) Q.push(node{m+1,r,M,R});

}

}

int main(){

int i,k;

scanf("%d%d",&n,&k);

FOR(i,1,n) scanf("%d",&a[i]);

\_l=1;\_r=0;

memset(pre,0x3f,sizeof(pre));pre[0]=0;

while(k--){

memset(dp,0x3f,sizeof(dp));

solve();

memcpy(pre,dp,sizeof(pre));

}

printf("%I64d",dp[n]);//最后一次认为在n点切即可

}

SPLAY

int a[maxn],cnt;

struct splay\_tree{

struct node{

int val,min,add,size,son[2];//add=lazy

bool rev;

void init(int \_val){//开始时T[i].val==a[i-1](线性的);

val=min=max=\_val;size=1;

if (\_val==INF) max=-INF;

add=rev=son[0]=son[1]=0;

}

}T[maxn\*2];//内存池

int fa[maxn\*2],root,tot;

void pushup(int x){

T[x].min=T[x].max=T[x].val;T[x].size=1;

if (T[x].val==INF) T[x].max=-INF;

if (T[x].son[0]){

T[x].min=min(T[x].min,T[T[x].son[0]].min);

T[x].max=max(T[x].max,T[T[x].son[0]].max);

T[x].size+=T[T[x].son[0]].size;

}

if (T[x].son[1]){

T[x].min=min(T[x].min,T[T[x].son[1]].min);

T[x].max=max(T[x].max,T[T[x].son[1]].max);

T[x].size+=T[T[x].son[1]].size;

}

}

void pushdown(int x){

if (x==0) return;

if (T[x].add){

if (T[x].son[0]){

T[T[x].son[0]].val+=T[x].add;

T[T[x].son[0]].min+=T[x].add;

T[T[x].son[0]].max+=T[x].add;

T[T[x].son[0]].add+=T[x].add;

}

if (T[x].son[1]){

T[T[x].son[1]].val+=T[x].add;

T[T[x].son[1]].min+=T[x].add;

T[T[x].son[1]].max+=T[x].add;

T[T[x].son[1]].add+=T[x].add;

}

T[x].add=0;

}

if (T[x].rev){

if (T[x].son[0]) T[T[x].son[0]].rev^=1;

if (T[x].son[1]) T[T[x].son[1]].rev^=1;

swap(T[x].son[0],T[x].son[1]);

T[x].rev=0;

}

}

void rotate(int x,int kind){//zig(1->) zag(0<-)都行

int y=fa[x],z=fa[y];

T[y].son[!kind]=T[x].son[kind],fa[T[x].son[kind]]=y;

T[x].son[kind]=y,fa[y]=x;

T[z].son[T[z].son[1]==y]=x,fa[x]=z;

pushup(y);

}

void splay(int x,int goal){//node x->goal's son

if (x==goal) return;

while (fa[x]!=goal){

int y=fa[x],z=fa[y];

pushdown(z),pushdown(y),pushdown(x);

int rx=T[y].son[0]==x,ry=T[z].son[0]==y;

if (z==goal) rotate(x,rx);

else{

if (rx==ry) rotate(y,ry);

else rotate(x,rx);

rotate(x,ry);

}

}

pushup(x);

if (goal==0) root=x;

}

int select(int pos){//getnode

int u=root;

pushdown(u);

while (T[T[u].son[0]].size!=pos){//这里由于头节点有个-INF 所以不-1

if (pos<T[T[u].son[0]].size) u=T[u].son[0];

else{

pos-=T[T[u].son[0]].size+1;

u=T[u].son[1];

}

pushdown(u);

}

return u;

}

**//下面是自己写的一点常用?函数**

void update(int l,int r,int val){

int u=select(l-1),v=select(r+1);

splay(u,0);

splay(v,u);

T[T[v].son[0]].min+=val;

T[T[v].son[0]].max+=val;

T[T[v].son[0]].val+=val;

T[T[v].son[0]].add+=val;//lazy

}

void reverse(int l,int r){

int u=select(l-1),v=select(r+1);

splay(u,0);splay(v,u);

T[T[v].son[0]].rev^=1;

}

void revolve(int l,int r,int x){//l~r->循环往后x位

int u=select(r-x),v=select(r+1);

splay(u,0);splay(v,u);

int tmp=T[v].son[0];T[v].son[0]=0;

pushup(v);pushup(u);

u=select(l-1),v=select(l);

splay(u,0);splay(v,u);

fa[tmp]=v;

T[v].son[0]=tmp;

pushup(v);pushup(u);

}

void cut(int l,int r,int x){//l~r->去掉的x位置后 //HDU3487

int u=select(l-1),v=select(r+1);

splay(u,0);splay(v,u);

int tmp=T[v].son[0];

T[v].son[0]=0;

pushup(v);pushup(u);

u=select(x);v=select(x+1);

splay(u,0);splay(v,u);

fa[tmp]=v;

T[v].son[0]=tmp;

pushup(v);pushup(u);

}

int query\_min(int l,int r){

int u=select(l-1),v=select(r+1);

splay(u,0);

splay(v,u);

return T[T[v].son[0]].min;

}

void insert(int x,int val){

int u=select(x),v=select(x+1);

splay(u,0);

splay(v,u);

T[tot].init(val);

fa[tot]=v;

T[v].son[0]=tot++;

pushup(v);pushup(u);

}

void erase(int x){

int u=select(x-1),v=select(x+1);

splay(u,0);

splay(v,u);

T[v].son[0]=0;

pushup(v);pushup(u);

}

void exchange(int l1,int r1,int l2,int r2){//r1-l1+1?=r2-l2+1 OK

if (l1>l2){swap(l1,l2);swap(r1,r2);}

int u=select(l1-1),v=select(r1+1);

splay(u,0);splay(v,u);

int tmp=T[v].son[0];T[v].son[0]=0;

pushup(v);pushup(u);

l2-=T[tmp].size;r2-=T[tmp].size;

int \_u=select(l2-1),\_v=select(r2+1);

splay(\_u,0);splay(\_v,\_u);

fa[tmp]=\_v;

swap(T[\_v].son[0],tmp);

pushup(\_v);pushup(\_u);

u=select(l1-1),v=select(l1);

splay(u,0);splay(v,u);

fa[tmp]=v;

T[v].son[0]=tmp;

pushup(v);pushup(u);

}

int dfs(int x,int k){//小于k的值个数,会被卡

if (x==0) return 0;

if (T[x].min!=INF&&T[x].min>=k) return 0;

if (T[x].max!=-INF&&T[x].max<k) return T[x].size;

int ret=T[x].val<k;

if (T[x].son[0]) ret+=dfs(T[x].son[0],k);

if (T[x].son[1]) ret+=dfs(T[x].son[1],k);

return ret;

}

**//小于k的值个数,会被卡 应该套主席树(但是太长，两个log)**

int query(int l,int r,int k){

int u=select(l-1),v=select(r+1);

splay(u,0);splay(v,u);

return dfs(T[v].son[0],k);

}

int build(int l,int r){

if (l>r) return 0;

if (l==r) return l;

int mid=(l+r)/2;

T[mid].son[0]=build(l,mid-1);

T[mid].son[1]=build(mid+1,r);

fa[T[mid].son[0]]=fa[T[mid].son[1]]=mid;

pushup(mid);

return mid;

}

void init(int n){

tot=0;

int i;//0是虚的;

T[tot++].init(INF);//空的

T[tot++].init(INF);//前后两个-INF节点

FOR(i,1,n) T[tot++].init(a[i]);

T[tot++].init(INF);

root=build(1,tot-1);

fa[root]=0;

fa[0]=0;T[0].son[1]=root;T[0].size=0;

}

void print(int now=-1){

if (now==-1) now=root;

pushdown(now);

if (T[now].son[0]) print(T[now].son[0]);

if (T[now].val!=-INF){

if (cnt++) printf(" ");

printf("%d",T[now].val);

}

if (T[now].son[1]) print(T[now].son[1]);

pushup(now);

}

}T;

SPLAY启发式合并

**//HDU6133，一棵树的合并**

struct splaytree{

struct node{

LL val,sum;

int son[2],size;

void init(LL \_val){

val=sum=\_val;size=1;

son[0]=son[1]=0;

}

}T[maxn];//编号是对应的

int fa[maxn];

int root;

inline void pushup(int x){

T[x].sum=T[x].val;

T[x].size=1;

if (T[x].son[0]){

T[x].sum+=T[T[x].son[0]].sum;

T[x].size+=T[T[x].son[0]].size;

}

if (T[x].son[1]){

T[x].sum+=T[T[x].son[1]].sum;

T[x].size+=T[T[x].son[1]].size;

}

}

void rotate(int x,int kind){

int y=fa[x],z=fa[y];

T[y].son[!kind]=T[x].son[kind],fa[T[x].son[kind]]=y;

T[x].son[kind]=y,fa[y]=x;

T[z].son[T[z].son[1]==y]=x,fa[x]=z;

pushup(y);

}

void splay(int x,int goal){

if (x==goal) return;

while (fa[x]!=goal){

int y=fa[x],z=fa[y];

int rx=T[y].son[0]==x,ry=T[z].son[0]==y;

if (z==goal) rotate(x,rx);

else{

if (rx==ry) rotate(y,ry);

else rotate(x,rx);

rotate(x,ry);

}

}

pushup(x);

if (goal==0) root=x;

}

LL insert(int x){//x为原先位置

int u=root,f=0;

while (u){

f=u;

if (T[x].val<T[u].val) u=T[u].son[0];

else u=T[u].son[1];

}

if (T[x].val<T[f].val) T[f].son[0]=x;

else T[f].son[1]=x;

fa[x]=f;

splay(x,0);

return T[T[x].son[0]].sum+T[x].val\*(T[T[x].son[1]].size+1);

}

LL dfs(int x){

int l=T[x].son[0],r=T[x].son[1];

LL ret=0;

T[x].init(T[x].val);

if (l) ret+=dfs(l);

ret+=insert(x);

if (r) ret+=dfs(r);

return ret;

}

LL merge(int x,int y,LL tmp,LL ret){

if (x==y) return tmp;

splay(x,0);splay(y,0);

if (T[x].size>T[y].size) swap(x,y),swap(tmp,ret);

root=y;

ret+=dfs(x);

return ret;

}

int getkth(int x,int k){//未验证,抄的前面那个板子

int u=root;

while (T[T[u].son[0]].size!=k){

if (k<T[T[u].son[0]].size) u=T[u].son[0];

else{

k-=T[T[u].son[0]].size+1;

u=T[u].son[1];

}

}

return T[x].val;

}

}T;

int n,m;

vector<int> edge[maxn];

LL ans[maxn];

int val[maxn];

void dfs(int x,int fa){

ans[x]=val[x];

for (int v:edge[x]){

if (v==fa) continue;

dfs(v,x);

ans[x]=T.merge(x,v,ans[x],ans[v]);

}

}

int i,j,k;

int main(){

int TT;

scanf("%d",&TT);

while (TT--){

scanf("%d",&n);

FOR(i,1,n) scanf("%d",&val[i]);

REP(i,n-1){

int u,v;

scanf("%d%d",&u,&v);

edge[u].push\_back(v);

edge[v].push\_back(u);

}

FOR(i,1,n) T.T[i].init(val[i]);

dfs(1,0);

FOR(i,1,n) printf("%lld ",ans[i]);

puts("");

FOR(i,1,n) T.fa[i]=0;

FOR(i,1,n) ans[i]=0,vector<int>().swap(edge[i]);

}

}

LCT

**//确认没写错，加边减边，改边权，查第二大值**

**//修改边权:把边当成点,mark一下,然后左右端点连边即可**

struct LCT{

struct node{

int son[2],val,size;

int max,add,cnt1;//max

int ans,lazy,cnt2;//second

bool rev;

void init(int \_val){

son[0]=son[1]=rev=add=0;

max=val=\_val;

size=1;

cnt1=1;cnt2=0;

ans=lazy=-INF;

}

}T[maxn];

bool root[maxn];

int fa[maxn];

void Reverse(int x){

T[x].rev^=1;

swap(T[x].son[0],T[x].son[1]);

}

void Add(int x,int val){

T[x].max+=val;

T[x].add+=val;

T[x].val+=val;

if (T[x].ans!=-INF) T[x].ans+=val;;

if (T[x].lazy!=-INF) T[x].lazy+=val;

}

void Change(int x,int val){//先change

T[x].max=val;

T[x].add=0;

T[x].val=val;

T[x].ans=-INF;

T[x].cnt2=-INF;

T[x].cnt1=T[x].size;

T[x].lazy=val;

}

void Update(int x,int val,int num){

if (T[x].max==val) T[x].cnt1+=num;

else if (T[x].max<val){

T[x].ans=T[x].max;

T[x].cnt2=T[x].cnt1;

T[x].max=val;

T[x].cnt1=num;

}

else if (T[x].ans==val) T[x].cnt2+=num;

else if (T[x].ans<val){

T[x].ans=val;

T[x].cnt2=num;

}

}

void pushup(int x){

T[x].size=1;

T[x].max=T[x].val;

T[x].ans=T[x].lazy=-INF;

T[x].cnt1=1;T[x].cnt2=0;

if (T[x].son[0]){

Update(x,T[T[x].son[0]].max,T[T[x].son[0]].cnt1);

Update(x,T[T[x].son[0]].ans,T[T[x].son[0]].cnt2);

T[x].size+=T[T[x].son[0]].size;

}

if (T[x].son[1]){

Update(x,T[T[x].son[1]].max,T[T[x].son[1]].cnt1);

Update(x,T[T[x].son[1]].ans,T[T[x].son[1]].cnt2);

T[x].size+=T[T[x].son[1]].size;

}

}

void pushdown(int x){

if (T[x].rev){

if (T[x].son[0]) Reverse(T[x].son[0]);

if (T[x].son[1]) Reverse(T[x].son[1]);

T[x].rev=0;

}

if (T[x].add){

if (T[x].son[0]) Add(T[x].son[0],T[x].add);

if (T[x].son[1]) Add(T[x].son[1],T[x].add);

T[x].add=0;

}

if (T[x].lazy!=-INF){

if (T[x].son[0]) Change(T[x].son[0],T[x].lazy);

if (T[x].son[1]) Change(T[x].son[1],T[x].lazy);

T[x].lazy=-INF;

}

}

void rotate(int x,int kind){

int y=fa[x],z=fa[y];

T[y].son[!kind]=T[x].son[kind],fa[T[x].son[kind]]=y;

T[x].son[kind]=y,fa[y]=x;

if (root[y]) {root[x]=true;root[y]=false;}

else T[z].son[T[z].son[1]==y]=x;

fa[x]=z;

pushup(y);

}

void Prechange(int x){

if (!root[x]) Prechange(fa[x]);

pushdown(x);

}

void splay(int x){//to root

Prechange(x);

while (!root[x]){

int y=fa[x],z=fa[y];

int rx=T[y].son[0]==x,ry=T[z].son[0]==y;

if (root[y]) rotate(x,rx);

else{

if (rx==ry) rotate(y,ry);

else rotate(x,rx);

rotate(x,ry);

}

}

pushup(x);

}

int access(int x){//只有这条链上的是mark的

int y=0;

for (;x;x=fa[x]){

splay(x);

root[T[x].son[1]]=true;

T[x].son[1]=y;

root[y]=false;

y=x;

pushup(x);

}

return y;

}

bool judge(int u,int v){

while (fa[u]) u=fa[u];

while (fa[v]) v=fa[v];

return u==v;

}

void makeroot(int x){

access(x);

splay(x);

Reverse(x);

}

bool link(int u,int v){

if (judge(u,v)) return 1;

makeroot(u);

fa[u]=v;

return 0;

}

bool cut(int u,int v){

makeroot(u);

splay(v);

fa[T[v].son[0]]=fa[v];

fa[v]=0;

root[T[v].son[0]]=true;

T[v].son[0]=0;

pushup(v);

return 0;

}

bool add(int u,int v,int val){

makeroot(u);

access(v);

splay(v);

Add(v,val);

return 0;

}

bool change(int u,int v,int val){

makeroot(u);

access(v);

splay(v);

Change(v,val);

return 0;

}

pair<int,int> ask(int u,int v){

makeroot(u);

access(v);

splay(v);

return make\_pair(T[v].ans,T[v].cnt2);

}

}T;

vector<int> edge[maxn];

void dfs(int x,int fa){

T.fa[x]=fa;

for (int v:edge[x]) if (v!=fa) dfs(v,x);

}

int n,m,TT;

int i,j,k;

int u,v;

int main(){

int x=0;

scanf("%d",&TT);

while (TT--) {

scanf("%d%d",&n,&m);

FOR(i,1,n){

int val;

scanf("%d",&val);

T.T[i].init(val);

}

FOR(i,1,n) T.root[i]=1;

REP(i,n-1){

scanf("%d%d",&u,&v);

edge[u].push\_back(v);

edge[v].push\_back(u);

}

dfs(1,0);

printf("Case #%d:\n",++x);

while(m--){

scanf("%d",&k);

int x,y;

if (k==1){

int x0,y0;

scanf("%d%d%d%d",&x,&y,&x0,&y0);

T.cut(x,y);

T.link(x0,y0);

}else if (k==2){

int val;

scanf("%d%d%d",&x,&y,&val);

T.change(x,y,val);

}else if (k==3){

int val;

scanf("%d%d%d",&x,&y,&val);

T.add(x,y,val);

}else if (k==4){

scanf("%d%d",&x,&y);

pair<int,int> t=T.ask(x,y);

if (t.first==-INF) puts("ALL SAME");

else printf("%d %d\n",t.first,t.second);

}

}

FOR(i,1,n) edge[i].clear();

}

}

莫队

struct node{int l,r,id;}Q[maxn];//new direction

int pos[maxn];

LL ans[maxn],flag[maxn];

int a[maxn];

bool cmp(node a,node b){

if (pos[a.l]==pos[b.l]) return a.r<b.r;

return pos[a.l]<pos[b.l];

}

int n,m,k; int i,j;

LL Ans;

int L=1,R=0;

void add(int x){

Ans+=flag[a[x]^k];

flag[a[x]]++; }

void del(int x){

flag[a[x]]--;

Ans-=flag[a[x]^k]; }

int main(){

scanf("%d%d%d",&n,&m,&k);

int sz=sqrt(n);

FOR(i,1,n){

scanf("%d",&a[i]);

a[i]^=a[i-1];

pos[i]=i/sz;

}

FOR(i,1,m){

scanf("%d%d",&Q[i].l,&Q[i].r);

Q[i].id=i;

}

sort(Q+1,Q+1+m,cmp);

flag[0]=1;

FOR(i,1,m){

while (L<Q[i].l){del(L-1);L++;}

while (L>Q[i].l){L--;add(L-1);}

while (R<Q[i].r){R++;add(R);}

while (R>Q[i].r){del(R);R--;}

ans[Q[i].id]=Ans;

}

FOR(i,1,m) printf("%I64d\n",ans[i]);

}

树上莫队(套分块)

//http://codeforces.com/gym/100962/attachments

//题意是求路径上最小没出现数字

//主要思路是分类,每个点进出各算一次可以消除影响

const int SIZE=500;

vector<pair<int,int> > edge[maxn];

int cl[maxn],cr[maxn],val[maxn],dfn[maxn<<1];

int tot;

int dfs(int x,int fa){

cl[x]=++tot;dfn[tot]=x;

for (auto now:edge[x]) if (now.first!=fa){

dfs(now.first,x);

val[now.first]=now.second;

}cr[x]=++tot;dfn[tot]=x;

}

int block[maxn<<1];

struct node{

int l,r,id;

}Q[maxn];

int cmp(node a,node b){

if (block[a.l]==block[b.l]) return a.r<b.r;

return block[a.l]<block[b.l];

}

bool vis[maxn];

int cnt[maxn],cur[maxn];//block,now

void change(int x){

x=dfn[x];vis[x]^=1;

if (vis[x]){

if (!cur[val[x]]) cnt[block[val[x]]]++;

cur[val[x]]++;

}else{

cur[val[x]]--;

if (!cur[val[x]]) cnt[block[val[x]]]--;

}

}

int ans[maxn];

int L,R;

int main(){

int n,q;

int i;

scanf("%d%d",&n,&q);

FOR(i,0,n\*2+1) block[i]=i/SIZE;

REP(i,n-1){

int u,v,len;

scanf("%d%d%d",&u,&v,&len);len=min(len,n+1);

edge[u].push\_back(make\_pair(v,len));

edge[v].push\_back(make\_pair(u,len));

}

val[1]=n+1;dfs(1,0);

REP(i,q){

int a,b;

scanf("%d%d",&a,&b);

if (cl[a]>cl[b]) swap(a,b);

if (cr[a]>cr[b]) Q[i].l=cl[a]+1,Q[i].r=cl[b];

else Q[i].l=cr[a],Q[i].r=cl[b];

Q[i].id=i;

}

sort(Q,Q+q,cmp);

L=1;R=0;

REP(i,q){

while (L<Q[i].l){change(L);L++;}

while (R>Q[i].r){change(R);R--;}

while (L>Q[i].l){L--;change(L);}

while (R<Q[i].r){R++;change(R);}

int now=0,j;

while (cnt[now]==SIZE) now++;

now\*=SIZE;

while (cur[now]) now++;

ans[Q[i].id]=now;

}

REP(i,q) printf("%d\n",ans[i]);

}

线性基(套路)

struct L\_B{

LL A[63];bool have\_0;

void clear(){memset(A,0,sizeof(A));have\_0=0;}

LL XORMIN(LL x){

int i;

rREP(i,63) if ((A[i]^x)<x) x^=A[i];

return x;

}

LL XORMAX(LL x){

int i;

rREP(i,63) if ((A[i]^x)>x) x^=A[i];

return x;

}

void insert(LL x){

int i;

if (!have\_0&&!XORMIN(x)) have\_0=1;

rREP(i,63) if ((x>>i)&1){

if (!A[i]) A[i]=x;x^=A[i];

}

}

void rebuild(){

int i,j;

rREP(i,63) rREP(j,i) if ((A[i]>>j)&1) A[i]^=A[j];

}

LL querykth(LL k){

LL ret=0;int i;k-=have\_0;

REP(i,63) if (A[i]) {if(k&1) ret^=A[i];k>>=1;}

if (k) return -1;

return ret;

}

}A;

# 图论

二分图匹配

**//最小不相交路径覆盖<=>节点数-拆点以后二分图最大匹配**

**//最小相交路径覆盖<=>所有能走到的节点连边，然后节点数-拆点以后匹配**

int n,m,i,j,k,t;

vector<int>edge[N];

int used[N];

int matching[N];

/\*注意数组的标号，必须满足二分图的条件

bool dfs(int u){

int v,i;

REP(i,edge[u].size()){

v=edge[u][i];

if (!used[v]){

used[v]=1;

if (matching[v]==-1||dfs(matching[v])){

matching[v]=u;

matching[u]=v;

return 1;

}

}

}return 0;

}

int DFS(){

int ans=0;

memset(matching,-1,sizeof(matching));

int u;

FOR(u,1,n){

if (matching[u]==-1){

memset(used,0,sizeof(used));

if (dfs(u)) ans++;

}

}return ans;

}\*/

/\*注意数组的标号，必须满足二分图的条件

queue<int> Q;

int prev[N];//两格

int check[N];//matchright

int BFS(){

int ans=0;

memset(matching,-1,sizeof(matching));

memset(check,-1,sizeof(check));

FOR(i,1,n){

if (matching[i]==-1){

while (!Q.empty()) Q.pop();

Q.push(i);

prev[i]=-1;

bool flag=false;

while (!Q.empty()&&!flag){

int u=Q.front();Q.pop();

for (j=0;!flag&&j<edge[u].size();j++){

int v=edge[u][j];

if (check[v]!=i){

check[v]=i;

Q.push(matching[v]);

if (matching[v]!=-1) prev[matching[v]]=u;

else{

flag=1;

int d=u,e=v;

while (d!=-1){

int t=matching[d];

matching[d]=e;

matching[e]=d;

d=prev[d];

e=t;

}

}

}

}

}

if (matching[i]!=-1) ans++;

}

}return ans;

}\*/

int main(){

int T;

scanf("%d",&T);

while (T--){

scanf("%d%d",&n,&m);

FOR(i,1,n){

scanf("%d",&k);

edge[i].clear();

REP(j,k) scanf("%d",&t),edge[i].push\_back(t+n);

}

if (BFS()==n) puts("YES");

else puts("NO");

}

}

最短路

**Dijkstra（n^2）：**

LL n,m,x;

LL a[N+2][N+2];

LL b[N+2];

bool vis[N+2];

LL i,j,k;

LL A,B,T;

int main()

{

scanf("%lld%lld%lld",&n,&m,&x);

FOR(i,n)

FOR(j,n) a[i][j]=INF;

FOR(i,m){

scanf("%lld%lld%lld",&A,&B,&T);

a[A][B]=T;

}

FOR(i,n) {b[i]=INF;vis[i]=0;}

b[0]=INF;

b[x]=0;

int pos;

FOR(i,n){

pos=0;

FOR(j,n) if (!vis[j]&&b[j]<b[pos]) pos=j;

vis[pos]=1;

FOR(j,n) if (!vis[j]&&b[pos]+a[pos][j]<b[j]) b[j]=b[pos]+a[pos][j];

}

FOR(i,n) printf("%lld ",b[i]);

}

**Dijkstra（堆优化）：**

struct node{

int n,d;

node(){}

node(int a,int b):n(a),d(b){}

bool operator<(const node&a)const{

if (d==a.d) return n<a.n;

return d>a.d;//注意！！！

}

};

vector<node> edge[maxn];//注意这里priority\_queue是大根堆

int dis[maxn],n,m;

void dij(int s){//DIJKSTRA+HEAP

int i;

FOR(i,1,n) dis[i]=INF;

dis[s]=0;

priority\_queue<node> Q;

Q.push(node(s,dis[s]));

while (!Q.empty()){

node x=Q.top();Q.pop();

REP(i,edge[x.n].size()){

node y=edge[x.n][i];

if (dis[y.n]>x.d+y.d){

dis[y.n]=x.d+y.d;

Q.push(node(y.n,dis[y.n]));

}

}

}

}

**SPFA BFS**

vector<node> edge[maxn];

int dis[maxn],n,m;

bool vis[maxn];

int sumnum[maxn];//judge negative ring

bool spfa(int s){

int i;

FOR(i,1,n) dis[i]=INF;

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

FOR(i,1,n) sumnum[i]=0;//judge negative ring

dis[s]=0;

deque<int> Q;//slf need

Q.push\_back(s);

// int sum=0;//lll

while (!Q.empty()){

int u=Q.front();Q.pop\_front();

// if (!Q.empty()&&sum/Q.size()<dis[u]) Q.push\_back(u);//lll

// else {vis[u]=0; sum-=dis[u];}//lll

vis[u]=0;//not lll

REP(i,edge[u].size()){

node v=edge[u][i];

if (dis[u]+v.d<dis[v.n]){

dis[v.n]=dis[u]+v.d;

if (!vis[v.n]){

vis[v.n]=1;

if (Q.empty()||dis[Q.front()]<dis[v.n]) Q.push\_back(v.n);//slf

else Q.push\_front(v.n);//slf

Q.push\_back(v.n);//not slf

// sumnum[v.n]++;//judge negative ring

// if (sumnum[v.n]>=n) return 1;//judge negative ring

// sum+=dis[v.n];//lll

}

}

}

}

// return 0;//judge negative ring

}

**SPFA DFS(只用于判负环)**

vector<node> edge[maxn];

int dis[maxn],n,m;

bool vis[maxn];

bool spfa(int u){

int i;

vis[u]=1;

REP(i,edge[u].size()){

node v=edge[u][i];

if (dis[u]+v.d<dis[v.n]){

dis[v.n]=dis[u]+v.d;

if (vis[v.n]) return 1;

else {

dis[v.n]=dis[u]+v.d;

if (spfa(v.n)) return 1;

}

}

}

vis[u]=0;

return 0;//judge negative ring

}

int s,t;

int u,v,len;

int main(){

int i,j,k;

while (~scanf("%d%d",&n,&m)){

FOR(i,1,n) edge[i].clear();

REP(i,m){

scanf("%d%d%d",&u,&v,&len);

edge[u].push\_back(node(v,len));

edge[v].push\_back(node(u,len));

}

dij(1);

FOR(i,2,n) printf("%d ",dis[i]==INF?-1:dis[i]);

puts("");

}

return 0;

}

差分约束系统

**//主要在于建图**

**//连边u->v,len <=> val(v)-val(u)<=len**

**//其他的都要化成这种形式 int n,m;**

int i,j;

struct node{

int n,d,next;

node(){}

node(int a,int b):n(a),d(b){}

bool operator<(const node &a)const{

if (d==a.d) return n<a.n;

return d>a.d;

}

}edge[150007];

int cnt=0;

int head[maxn];

void addedge(int u,int v,int len){

edge[cnt].n=v;

edge[cnt].d=len;

edge[cnt].next=head[u];

head[u]=cnt++;

};

int dis[maxn];

void dij(int s){

int i;

FOR(i,1,n) dis[i]=INF;

dis[s]=0;

priority\_queue<node> Q;

Q.push(node(s,dis[s]));

while (!Q.empty()){

node x=Q.top();Q.pop();

for(i=head[x.n];i!=-1;i=edge[i].next){

node &y=edge[i];

if (dis[y.n]>x.d+y.d){

dis[y.n]=x.d+y.d;

Q.push(node(y.n,dis[y.n]));

}

}

}

}

int u,v,len;

int main(){

while (~scanf("%d%d\n",&n,&m)){

memset(head,0xff,sizeof(head));

cnt=0;

REP(i,m){

scanf("%d%d%d",&u,&v,&len);

//val(v)-val(u)<=len

addedge(u,v,len);

}

dij(1);

printf("%d\n",dis[n]);

}

}

01分数规划

**//2017-harbin-K**

**//选出k个区间，使得这k个区间全覆盖，而且sigmaA/sigmaB最小**

**//俩log dp TLE**

**//做法：建最短路，01分数规划玄学过题**

struct node{

int n;

double d;

node(){}

node(int \_n,double \_d):n(\_n),d(\_d){};

bool operator<(const node&A)const{

if (d==A.d) return n<A.n;

return d>A.d;

}

};

struct node\_e{

int n,A,B;

double d;

node\_e(int \_n,int \_A,int \_B,double \_d):n(\_n),A(\_A),B(\_B),d(\_d){}

};

vector<node\_e> edge[maxn];

int dis[maxn];

int preA[maxn],preB[maxn];

void dij(int s,int n){

int i;

FOR(i,1,n) dis[i]=INF;

dis[s]=0;

priority\_queue<node> Q;

Q.push(node(s,dis[s]));

while (Q.size()){

node x=Q.top();Q.pop();

for (auto &y:edge[x.n]){

if (dis[y.n]>x.d+y.d){

dis[y.n]=x.d+y.d;

Q.push(node(y.n,dis[y.n]));

preA[y.n]=preA[x.n]+y.A;

preB[y.n]=preB[x.n]+y.B;

}

}

}

}

int n,t;

int S[maxn],T[maxn],A[maxn],B[maxn];

double check(double x){

int i;double allA=0,allB=0;

FOR(i,1,t+1)

edge[i].clear();

FOR(i,1,n){

if (A[i]-B[i]\*x<=0){

allA+=A[i];allB+=B[i];

edge[S[i]].emplace\_back(node\_e(T[i]+1,0,0,0));

}else edge[S[i]].emplace\_back(node\_e(T[i]+1,A[i],B[i],A[i]-B[i]\*x));

}

FOR(i,1,t)

edge[i+1].emplace\_back(node\_e(i,0,0,0));

dij(1,t+1);

allA+=preA[t+1];allB+=preB[t+1];

return allA/allB;

}

int main(){

int i,j,m,x,\_T;

scanf("%d",&\_T);

while (\_T--){

scanf("%d%d",&n,&t);

FOR(i,1,n)

scanf("%d%d%d%d",&S[i],&T[i],&A[i],&B[i]);

double ans=100;

while (1){

double now=check(ans);

if (abs(now-ans)<0.001) break;

ans=now;

}

printf("%.3lf\n",ans);

}

return 0;

}

最小生成树

**//最小曼哈顿距离生成树忘了留板子。。。去看匡斌大佬的板子吧**

**//最大曼哈顿距离生成树是维护最远的点的距离（四个方向的）**

**//Kruskal(有道分治题用的Boruvka，和这个思想也类似)**

**//注意理解并查集的内涵，每次找最短的路也可以通过其他方式来找到**

struct node{

int u,v,len;

bool operator<(const node &A)const{

if (len!=A.len) return len<A.len;

if (u!=A.u) return u<A.u;

return v<A.v;

}

}Edge[maxn];

priority\_queue<node> Q;

int fa[maxn];

inline void getfather(int x){

if (x==fa[x]) return x;

return fa[x]=getfather(fa[x]);

}

int n,m;

int main()

{

scanf("%d%d",&n,&m);

REP(i,m) scanf("%d%d%d",Edge[i].u,Edge[i].v,Edge[i].len);

sort(Edge,Edge+m);

while(Q.size()){

edge=Edge[]();

if (getfather(edge.u)==getfather(edge.v)) continue;

fa[getfather[u]]=v;

edge[u].push\_back(v);

}

}

强连通分量tarjin

vector<int> E[maxn];

int dfn[maxn],low[maxn],tot,n,ans=INF,cnt;

bool vis[maxn];

stack<int> S;

vector<int> V[maxn];

//u割点:lowlink[u]>=dfn[v];

//uv割边:lowlink[u]>dfn[v];

//块:lowlink[u]==dfn[v];

void tarjin(int x){

low[x]=dfn[x]=++tot;

S.push(x);vis[i]=1;

for (int i=0;i<E[x].size();i++){

int v=E[x][i];

if (!dfn[v]){

tarjin(x);

low[x]=min(low[x],low[v]);

}else if (vis[v]){

low[x]=min(low[x],dfn[v]);

}

}

if (low[x]==dfn[x]){

cnt++;

while (1){

int now=S.top();S.pop();

vis[now]=0;

V[cnt].push\_back(now);//改成id[]=即可

if (now==x) break;

}

}

}

网络流

**最大权闭合图**

**题意:给定一个有向图,每个点有权值,求最大权闭合图(与没选的没边相连),使得sigma(val)最大**

**做法:S->+node(val);-node->T(-val);原边->INF,与S相连的最小割即为所求**

**原因:简单割=>切的全是和S,T相连的边**

**假设最终与S相连的点正的x1,负的y1;T的正的x2,负的y2,(x2=S切,y1=T切)**

**最小割C=S切的正的+T切的负的=x2+y1(即反过来)**

**要求的val=x1-y1**

**C+val=x1+x2=定值,val=x1+x2-C**

**C最小,即最大流**

**最大密度子图**

**这个是转化成权闭合图的做法：**

**二分答案**

**将边看成点**

**S->边,1**

**边->连着的两点,1**

**每个点->T,val**

**求完即可**

**因为 边-k\*点>=0,二分出这个即可得到答案**

**做法二：**

**s->顶点，权值m**

**顶点之间连边，权值1**

**顶点->T，m+2\*ans-d[i](度数)**

**满流就OK**

**//DINIC+当前弧优化**

struct node{

int to,cap,next;

node(int t=0,int c=0,int n=0):to(t),cap(c),next(n){}

}edge[maxn\*50];

int head[maxn];

int tot;

void addedge(int from,int to,int cap){

edge[tot].to=to;

edge[tot].next=head[from];

edge[tot].cap=cap;

head[from]=tot++;

edge[tot].to=from;

edge[tot].next=head[to];

edge[tot].cap=0;

head[to]=tot++;

}

queue<int> Q;

bool vis[maxn];

int d[maxn];

int cur[maxn];//当前弧优化

bool bfs(int s,int t){

memset(vis,0,sizeof(vis));

while (Q.size()) Q.pop();

Q.push(s);

d[s]=0;vis[s]=1;

int i;

while (!Q.empty()){

int x=Q.front();Q.pop();

for(i=head[x];i!=-1;i=edge[i].next){

if (!vis[edge[i].to]&&edge[i].cap){

vis[edge[i].to]=1;

d[edge[i].to]=d[x]+1;

Q.push(edge[i].to);

}

}

}

return vis[t];

}

int dfs(int x,int t,int flow){

if (x==t||flow==0) return flow;

int i,ret=0,f;

for (i=cur[x];i!=-1;i=edge[i].next){

if (d[x]+1==d[edge[i].to]&&((f=dfs(edge[i].to,t,min(flow,edge[i].cap)))>0)){

edge[i].cap-=f;

edge[i^1].cap+=f;

ret+=f;

flow-=f;

cur[x]=i;

if (flow==0) break;

}

}

return ret;

}

int n,m,i;

int u,v,len,ans;

int s,t;

int main(){

while (~scanf("%d%d",&n,&m)){

memset(head,-1,sizeof(head));

ans=0;tot=0;

s=n+1;t=n+2;

FOR(i,1,n){

int a,b;

scanf("%d%d",&a,&b);

addedge(s,i,a);

addedge(i,t,b);

}

FOR(i,1,m){

scanf("%d%d%d",&u,&v,&len);

addedge(u,v,len);

addedge(v,u,len);

}

while (bfs(s,t)){

int f;

memcpy(cur,head,sizeof(head));

while (f=dfs(s,t,INF)) ans+=f;

}

printf("%d\n",ans);

}

}

**//ISAP**

struct node{

int to,cap,next;

node(int t=0,int c=0,int n=0):to(t),cap(c),next(n){}

}edge[maxn\*50];

int head[maxn];

int tot;

void addedge(int from,int to,int cap,int rcap=0){

edge[tot].to=to;edge[tot].next=head[from];edge[tot].cap=cap;head[from]=tot++;

edge[tot].to=from;edge[tot].next=head[to];edge[tot].cap=rcap;head[to]=tot++;

}

queue<int> Q;

int gap[maxn],dep[maxn],cur[maxn];

void bfs(int s,int t){

memset(dep,0xff,sizeof(dep));

memset(gap,0,sizeof(gap));

gap[0]=1;

dep[t]=0;

Q.push(t);

while (Q.size()){

int u=Q.front();Q.pop();

for(int i=head[u];i!=-1;i=edge[i].next){

int v=edge[i].to;

if (dep[v]!=-1) continue;

Q.push(v);

dep[v]=dep[u]+1;

gap[dep[v]]++;

}

}

}

int S[maxn];

int sap(int s,int t,int n){

bfs(s,t);

memcpy(cur,head,sizeof(head));

int top=0,u=s,ret=0;

while (dep[s]<n){

if (u==t){

int MIN=INF,inser,i;

REP(i,top) if (MIN>edge[S[i]].cap) MIN=edge[S[i]].cap,inser=i;

REP(i,top) edge[S[i]].cap-=MIN,edge[S[i]^1].cap+=MIN;

ret+=MIN;

top=inser;

u=edge[S[top]^1].to;

continue;

}

bool flag=0;

int v;

for (int i=cur[u];i!=-1;i=edge[i].next){

v=edge[i].to;

if (edge[i].cap&&dep[v]+1==dep[u]){

flag=1;

cur[u]=i;

break;

}

}

if (flag){

S[top++]=cur[u];

u=v;

continue;

}

int MIN=n;

for (int i=head[u];i!=-1;i=edge[i].next){

v=edge[i].to;

if (edge[i].cap&&dep[v]<MIN) MIN=min(MIN,dep[v]),cur[u]=i;

}

gap[dep[u]]--;

if (!gap[dep[u]]) return ret;

dep[u]=MIN+1;

gap[dep[u]]++;

if (u!=s) u=edge[S[--top]^1].to;

}

return ret;

}

int n,m,s,t;

int main(){

while (~scanf("%d%d",&n,&m)){

memset(head,-1,sizeof(head));

tot=0;

s=n+1;t=n+2;

int i;

FOR(i,1,n){

int a,b;

scanf("%d%d",&a,&b);

addedge(s,i,a);

addedge(i,t,b);

}

FOR(i,1,m){

int u,v,len;

scanf("%d%d%d",&u,&v,&len);

addedge(u,v,len,len);

}

printf("%d\n",sap(s,t,n+2));

}

}

最小费用流

**//拆点后可以S向入连边,出向T连边,然后入和出就可以保持动态平衡**

**//注意观察特殊性质**

struct node{

LL to,cap,cost,rev;

node(int t=0,int c=0,int n=0,int r=0):to(t),cap(c),cost(n),rev(r){}

};

vector<node> edge[maxn];

void addedge(int from,int to,LL cap,LL cost){

edge[from].push\_back(node(to,cap,cost,edge[to].size()));

edge[to].push\_back(node(from,0,-cost,edge[from].size()-1));

}

int n,m,V;

LL dis[maxn];

bool mark[maxn];

int pre\_v[maxn],pre\_e[maxn];

deque<int> Q;

pair<LL,LL> mincostflow(int s,int t,LL f){

LL ret=0,d;

int i,v;

while (f){

memset(dis,0x3f,sizeof(dis));

memset(mark,0,sizeof(mark));

while (Q.size()) Q.pop\_front();

dis[s]=0;Q.push\_back(s);

while (Q.size()){

v=Q.front();mark[v]=0;Q.pop\_front();

REP(i,edge[v].size()){

node &e=edge[v][i];

if (e.cap>0&&dis[e.to]>dis[v]+e.cost){

dis[e.to]=dis[v]+e.cost;

pre\_v[e.to]=v;

pre\_e[e.to]=i;

if (!mark[e.to]){

if (Q.empty()||dis[Q.front()]<dis[e.to]) Q.push\_back(e.to);

else Q.push\_front(e.to);

mark[e.to]=1;

}

}

}

}

if (dis[t]==INFF) break;

d=f;

for (v=t;v!=s;v=pre\_v[v])

d=min(d,edge[pre\_v[v]][pre\_e[v]].cap);

f-=d;

ret+=d\*dis[t];

for (v=t;v!=s;v=pre\_v[v]){

node &e=edge[pre\_v[v]][pre\_e[v]];

e.cap-=d;

edge[v][e.rev].cap+=d;

}

if (d==0) break;

}

return make\_pair(INFF-f,ret);

}

int i,j,k;

int main(){

scanf("%d%d",&n,&m);

FOR(i,1,m){

LL u,v,c,w;

scanf("%lld%lld%lld%lld",&u,&v,&c,&w);

addedge(u,v,c,w);

}V=n;

pair<LL,LL> ans=mincostflow(1,n,INFF);

printf("%lld %lld",ans.first,ans.second);

}

上下界网络流

**//可二分t->s边的下/上界,即可达到最大最小流**

**//最大流:t->s连边,ss->tt流,s->t正向最大流,会流掉反向建的边的流量**

**//最小流:ss->tt流,t->s连边,ss->tt流**

int n,m,q;

int i,j,k;

int ss,tt;

struct node{

int to,cap,next;

}edge[maxn\*3];

int tot;

int head[307];

int addedge(int from,int to,int cap){

edge[tot].to=to;

edge[tot].next=head[from];

edge[tot].cap=cap;

head[from]=tot++;

edge[tot].to=from;

edge[tot].next=head[to];

edge[tot].cap=0;

head[to]=tot++;

return tot-1;//反的边 cap=正的 flow

}

bool vis[307];

int d[307];

queue<int> Q;

bool bfs(int s,int t){

memset(vis,0,sizeof(vis));

while (Q.size()) Q.pop();

Q.push(s);

d[s]=0;vis[s]=1;

int i;

while (Q.size()){

int x=Q.front();Q.pop();

for (i=head[x];i!=-1;i=edge[i].next){

if (!vis[edge[i].to]&&edge[i].cap){

vis[edge[i].to]=1;

d[edge[i].to]=d[x]+1;

Q.push(edge[i].to);

}

}

}

return vis[t];

}

int cur[307];//当前弧优化

int dfs(int x,int t,int flow){//dinic

if (x==t||flow==0) return flow;

int i,ret=0,f;

for (i=cur[x];i!=-1;i=edge[i].next){

if (d[x]+1==d[edge[i].to]&&(f=dfs(edge[i].to,t,min(flow,edge[i].cap)))>0){

edge[i].cap-=f;

edge[i^1].cap+=f;

ret+=f;

flow-=f;

cur[x]=i;

if (flow==0) break;

}

}

return ret;

}

int in[307],out[307];

int add(int u,int v,int low,int high){

int ret=addedge(u,v,high-low);

out[u]+=low;in[v]+=low;

return ret;

}

int sum,flow,E[maxn],ans[maxn];//E为对应的边位置

int solve(){

memset(head,0xff,sizeof(head));

memset(in,0,sizeof(in));

memset(out,0,sizeof(out));

scanf("%d%d",&n,&m);

flow=0;sum=0;tot=0;

FOR(i,1,m){

int u,v,low,high;

scanf("%d%d%d%d",&u,&v,&low,&high);

ans[i]=low;

E[i]=add(u,v,low,high);//E[i]很有用

}

ss=n+1;tt=n+2;

FOR(i,1,n){

sum+=max(in[i]-out[i],0);

if (in[i]>out[i]) addedge(ss,i,in[i]-out[i]);

if (in[i]<out[i]) addedge(i,tt,out[i]-in[i]);

}

while (bfs(ss,tt)){

int f;

memcpy(cur,head,sizeof(head));

while (f=dfs(ss,tt,INF)) flow+=f;

}

if (flow!=sum) return 0\*puts("NO");

else {

puts("YES");

FOR(i,1,m){

ans[i]+=edge[E[i]].cap;

printf("%d\n",ans[i]);

}

}

}

int main()

{

int T;

scanf("%d",&T);

while (T--){

solve();

}

}

上下界费用流

**// Hihocoder 1424，限制很多的一道题，只是留板子**

struct node{

LL to,cap,cost,rev;

node(int t=0,int c=0,int n=0,int r=0):to(t),cap(c),cost(n),rev(r){}

};

vector<node> edge[maxn];

void addedge(int from,int to,LL cap,LL cost){

edge[from].push\_back(node(to,cap,cost,edge[to].size()));

edge[to].push\_back(node(from,0,-cost,edge[from].size()-1));

}

LL dis[maxn];

bool mark[maxn];

int pre\_v[maxn],pre\_e[maxn];

deque<int> Q;

pair<int,int> mincostflow(int s,int t,int f){

int ret=0,d;

int i,v;

while (f){

memset(dis,0x3f,sizeof(dis));

memset(mark,0,sizeof(mark));

while (Q.size()) Q.pop\_front();

dis[s]=0;Q.push\_back(s);

while (Q.size()){

v=Q.front();mark[v]=0;Q.pop\_front();

REP(i,edge[v].size()){

node &e=edge[v][i];

if (e.cap>0&&dis[e.to]>dis[v]+e.cost){

dis[e.to]=dis[v]+e.cost;

pre\_v[e.to]=v;

pre\_e[e.to]=i;

if (!mark[e.to]){

if (Q.empty()||dis[Q.front()]<dis[e.to]) Q.push\_back(e.to);

else Q.push\_front(e.to);

mark[e.to]=1;

}

}

}

}

if (dis[t]==INF) break;

d=f;

for (v=t;v!=s;v=pre\_v[v])

d=min(d,edge[pre\_v[v]][pre\_e[v]].cap);

f-=d;

ret+=d\*dis[t];

for (v=t;v!=s;v=pre\_v[v]){

node &e=edge[pre\_v[v]][pre\_e[v]];

e.cap-=d;

edge[v][e.rev].cap+=d;

}

if (d==0) break;

}

return make\_pair(INF-f,ret);

}

int n,m;

int i,j;

int VAL[57][57];

int addrow[57][57];

int addcol[57][57];

int row[57],col[57];

int in[maxn],out[maxn];

int u,v;

int s,t,S,T;

int tot;

int sum;

void add(int u,int v,int low,int high,int cost){

addedge(u,v,high-low,cost);

out[u]+=low;in[v]+=low;

}

void solve(int n){

tot=0;

FOR(i,1,n) row[i]=++tot;

FOR(i,1,n) col[i]=++tot;

s=++tot;t=++tot;

S=++tot;T=++tot;

FOR(i,1,n)

FOR(j,1,n) scanf("%d",&VAL[i][j]);

FOR(i,1,n){

int cnt=0;

FOR(j,1,n) cnt+=VAL[i][j];

add(s,row[i],cnt,cnt,0);

cnt=0;

FOR(j,1,n) cnt+=VAL[j][i];

add(s,col[i],cnt,cnt,0);

}

FOR(i,1,n){

int l,r;

scanf("%d%d",&l,&r);

add(row[i],t,l,r,0);

}

FOR(i,1,n){

int l,r;

scanf("%d%d",&l,&r);

add(col[i],t,l,r,0);

}

FOR(i,1,n)

FOR(j,1,n) addrow[i][j]=addcol[i][j]=0;

REP(i,n\*n/2){

int x0,y0,x1,y1;

scanf("%d%d%d%d",&x0,&y0,&x1,&y1);

if (VAL[x0][y0]==VAL[x1][y1]) continue;

if (VAL[x0][y0]==1){

if (y0==y1) addrow[x0][x1]++;

else addcol[y0][y1]++;

}else if (VAL[x1][y1]==1){

if (y0==y1) addrow[x1][x0]++;

else addcol[y1][y0]++;

}

}

FOR(i,1,n){

FOR(j,1,n){

if (addrow[i][j]) add(row[i],row[j],0,addrow[i][j],1);

if (addcol[i][j]) add(col[i],col[j],0,addcol[i][j],1);

}

}

sum=0;

add(t,s,0,INF,0);

FOR(i,1,tot){

sum+=max(in[i]-out[i],0);

if (in[i]>out[i]) addedge(S,i,in[i]-out[i],0);

if (in[i]<out[i]) addedge(i,T,out[i]-in[i],0);

}

pair<int,int> now=mincostflow(S,T,INF);

if (now.first!=sum) puts("-1");

else printf("%d\n",now.second);

FOR(i,1,tot) edge[i].clear();

FOR(i,1,tot) in[i]=out[i]=0;

}

int main()

{

while (~scanf("%d",&n)) solve(n);

}

树分治

**//乘积立方数个数，如果是sum直接枚举其实就好**

LL K;

LL MUL[37];

LL getSum(LL x,LL y){

LL ret=0,i;

REP(i,K) ret=ret+(x/MUL[i]%3+y/MUL[i]%3)%3\*MUL[i];

return ret;

}

LL getDiv(LL x){

LL ret=0,i;

REP(i,K) ret=ret+(3-x/MUL[i]%3)%3\*MUL[i];

return ret;

}

LL color[maxn];

vector<int> edge[maxn];

LL ans;

int size[maxn];

bool mark[maxn];

int minweight,root;

void dfs1(int x,int fa,int n){

int weight=0;

size[x]=1;

for (int v:edge[x]){

if (v==fa||mark[v]) continue;

dfs1(v,x,n);

size[x]+=size[v];

weight=max(weight,size[v]);

}

weight=max(weight,n-size[x]);

if (weight<minweight) {root=x;minweight=weight;}

}

map<LL,int> now;

map<LL,int> MP;

void dfs2(int x,int fa,LL num){

now[getSum(color[x],num)]++;

for (int v:edge[x]){

if (v==fa||mark[v]) continue;

dfs2(v,x,getSum(num,color[x]));

}

}

void calc(int x){

MP.clear();

MP[color[x]]++;

for (int u:edge[x]){

if (mark[u]) continue;

now.clear();

dfs2(u,0,0);

for(pair<LL,int> P:now) ans+=MP[getDiv(P.first)]\*P.second;

for(pair<LL,int> P:now) MP[getSum(color[x],P.first)]+=P.second;

}

MP.clear();

}

void dfs3(int x){

mark[x]=1;

calc(x);

for (int v:edge[x]){

if (mark[v]) continue;

minweight=size[v];

dfs1(v,0,size[v]);

dfs3(root);

}

}

int n,m;

LL C[maxn];

LL P;

int main(){

int i,j;

MUL[0]=1;

FOR(i,1,33) MUL[i]=MUL[i-1]\*3;

while (~scanf("%d",&n)){

ans=0;

scanf("%d",&K);

REP(i,K) scanf("%lld",&C[i]);

FOR(i,1,n){

scanf("%lld",&P);

REP(j,K){

int t=0;

while (P%C[j]==0){

P/=C[j];

t++;

if (t==3) t=0;

}

color[i]+=MUL[j]\*t;

}

if (color[i]==0) ans++;

}

REP(i,n-1){

int u,v;

scanf("%d%d",&u,&v);

edge[u].push\_back(v);

edge[v].push\_back(u);

}

minweight=n;

dfs1(1,0,n);

dfs3(root);

printf("%lld\n",ans);

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

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

FOR(i,1,n) vector<int>().swap(edge[i]);

}

}

部分树上dp

**到叶结点最大距离**

void dfs1(int u,int from){

int v,w,i;

REP(i,edge[u].size()){

v=edge[u][i].first;

if (v==from) continue;

w=edge[u][i].second;

dfs1(v,u);

if (l1[u]<l1[v]+w) l2[u]=l1[u],l1[u]=l1[v]+w,son[u]=v;

else if (l2[u]<l1[v]+w) l2[u]=l1[v]+w;

}

}

void dfs2(int u,int from,LL d){//从叶子开始

int v,w,i;

len[u]=max(d,l1[u]);

REP(i,edge[u].size()){

v=edge[u][i].first;

if (v==from) continue;

w=edge[u][i].second;

if (son[u]==v) dfs2(v,u,max(d,l2[u])+w);

else dfs2(v,u,max(d,l1[u])+w);

}

}

**另一种方法**

void dfs1(int u,int x,int length){//需要好多次(findmaxlen)

int i;

if (length>len[u]) len[u]=length;

if (length>mxlen) mx=u,mxlen=length;

REP(i,edge[u].size())

if (edge[u][i]!=x) dfs1(edge[u][i],u,length+1);

}

void dfs2(int x,int father){

int i;

root[x]=father;

value[father].push\_back(len[x]);

num[father]++;

REP(i,edge[x].size())

if (!root[edge[x][i]]) dfs2(edge[x][i],father);

}

**从求含某条边的最小生成树截下来的代码(当然前面sort了)合并(要记得merge咋写)**

inline int Union(int u,int v,int len){

int ret=0;

while (u!=v&&(fa[u]!=u||fa[v]!=v)){

if (fa[u]==u||fa[v]!=v&&sz[u]>sz[v]) {ret=max(ret,val[v]);v=fa[v];}

else {ret=max(ret,val[u]);u=fa[u];}

}

if (u==v) return ret;

if (sz[u]>sz[v]) swap(u,v);

fa[u]=v;val[u]=len;

sz[v]+=sz[u];ans=ans+len;

return len;

}

**树上距离除k向上取整**

LL count[maxn][6];

vector<int> edge[maxn];

LL num[maxn],cnt[maxn];//端点,满足条件的次数

int k;

LL ans;

void dfs(int u,int from){

int i,j,c1,c2;

count[u][0]=1;

cnt[u]=1;

REP(i,edge[u].size()){

int v=edge[u][i];

if (from==v) continue;

dfs(v,u);

REP(c1,k)

REP(c2,k){

ans+=count[u][c1]\*count[v][c2];

if (c1+c2+1>k) ans+=count[u][c1]\*count[v][c2];

}

ans+=cnt[u]\*num[v]+num[u]\*cnt[v];

num[u]+=num[v]+count[v][k-1];

cnt[u]+=cnt[v];

REP(c1,k) count[u][c1]+=count[v][(c1-1+k)%k];

}

}

2-sat

**//重点是维护拆点后各种限制之间的关系，这个是个二分以后2-sat的**

struct Tsat{

vector<int> edge[maxn\*2];

stack<int> S;

int belong[maxn\*2];

int dfn[maxn\*2],low[maxn\*2];

bool vis[maxn\*2];

int tot,cnt;

bool mark;

void init(int n){

tot=cnt=0;

int i;

REP(i,n\*2) edge[i].clear();

REP(i,n\*2) dfn[i]=vis[i]=low[i]=belong[i]=0;

}

void dfs(int u){

int i;

dfn[u]=low[u]=++tot;

S.push(u);vis[u]=1;

REP(i,edge[u].size()){

int v=edge[u][i];

if (!dfn[v]){

dfs(v);

low[u]=min(low[u],low[v]);

}else if (vis[v]){

low[u]=min(low[u],dfn[v]);

}

}

if (dfn[u]==low[u]){

cnt++;

while (1){

int now=S.top();S.pop();

vis[now]=0;

belong[now]=cnt;

if (now==u) break;

}

}

}

inline void addedge(int u,int v){

edge[u].push\_back(v);

}

bool solve(int n){

int i;

REP(i,n\*2) if (!dfn[i]) dfs(i);

REP(i,n) if (belong[i]==belong[i+n]) return 0;

return 1;

}

}sat;

int n,m,t;

int numA,numB;

int A[maxn][2],B[maxn][2];

int i,j;

int tot;

struct node{

int x,y;

}S1,S2,a[maxn];

inline int dist(node A,node B){

return abs(A.x-B.x)+abs(A.y-B.y);

}

void preadd(){

int i,u,v;

REP(i,numA){

u=A[i][0];v=A[i][1];

sat.addedge(u,v+n);sat.addedge(u+n,v);

sat.addedge(v,u+n);sat.addedge(v+n,u);

}

REP(i,numB){

u=B[i][0];v=B[i][1];

sat.addedge(u,v);sat.addedge(u+n,v+n);

sat.addedge(v,u);sat.addedge(v+n,u+n);

}

}

bool solve(int x){

sat.init(n);

preadd();

int i,j;

REP(i,n)

rep(j,i+1,n){

if (dist(a[i],S1)+dist(a[j],S1)>x) {sat.addedge(i,j+n);sat.addedge(j,i+n);}

if (dist(a[i],S2)+dist(a[j],S2)>x) {sat.addedge(i+n,j);sat.addedge(j+n,i);}

if (dist(a[i],S1)+dist(a[j],S2)+dist(S1,S2)>x) {sat.addedge(i,j);sat.addedge(j+n,i+n);}

if (dist(a[i],S2)+dist(a[j],S1)+dist(S1,S2)>x) {sat.addedge(i+n,j+n);sat.addedge(j,i);}

}

return sat.solve(n);

}

int l,r,mid;

int main(){

int t,m;

while (~scanf("%d%d%d",&n,&numA,&numB)){

scanf("%d%d%d%d",&S1.x,&S1.y,&S2.x,&S2.y);

REP(i,n) scanf("%d%d",&a[i].x,&a[i].y);

REP(i,numA) {scanf("%d%d",&A[i][0],&A[i][1]);A[i][0]--;A[i][1]--;}/\*careful!!!\*/

REP(i,numB) {scanf("%d%d",&B[i][0],&B[i][1]);B[i][0]--;B[i][1]--;}/\*careful!!!\*/

l=-1;r=5000000;

while (l+1<r){

mid=(r+l)/2;

if (!solve(mid)) l=mid;

else r=mid;

}

if (l<4500000) printf("%d\n",l+1);

else printf("-1\n");

}

}

dfs序

**//常用方法：时间戳、莫队、拆开操作**

void dfs(int u,int from){

int v,i;

in[u]=++tot;

REP(i,edge[u].size()){

v=edge[u][i];

if (v==from) continue;

dfs(v,u);

}

out[u]=tot;

}

树链剖分

**难题(区间合并)**

int tot;

struct node{

int lval,rval,ldown,lup,rdown,rup,upmx,downmx;

node():upmx(0),downmx(0){};

}tree[maxn<<2];

int a[maxn];

node merge(node L,node R){

if (L.upmx==0) return R;

if (R.upmx==0) return L;

node ret;

ret.upmx=max(L.upmx,R.upmx);

ret.downmx=max(L.downmx,R.downmx);

ret.lval=L.lval;

ret.lup=L.lup;

ret.ldown=L.ldown;

ret.rval=R.rval;

ret.rup=R.rup;

ret.rdown=R.rdown;

if (L.rval<R.lval){

ret.upmx=max(ret.upmx,L.rup+R.lup);

if (L.downmx==1) ret.lup=L.lup+R.lup;

if (R.downmx==1) ret.rup=L.rup+R.rup;

}

if (L.rval>R.lval){

ret.downmx=max(ret.downmx,L.rdown+R.ldown);

if (L.upmx==1) ret.ldown=L.ldown+R.ldown;

if (R.upmx==1) ret.rdown=L.rdown+R.rdown;

}

return ret;

}

void build(int x,int l,int r){

if (l==r){

tree[x].lval=tree[x].rval=a[l];

tree[x].lup=tree[x].ldown=tree[x].rup=tree[x].rdown=tree[x].upmx=tree[x].downmx=1;

return;

}

int mid=(l+r)/2;

build(x<<1,l,mid);

build(x<<1|1,mid+1,r);

tree[x]=merge(tree[x<<1],tree[x<<1|1]);

}

node query(int x,int l,int r,int L,int R){

node ret;

if (l<=L&&R<=r) return tree[x];

int mid=(L+R)/2;

if (mid>=l&&r>mid) return merge(query(x<<1,l,r,L,mid),query(x<<1|1,l,r,mid+1,R));

if (mid>=l) return query(x<<1,l,r,L,mid);

return query(x<<1|1,l,r,mid+1,R);

}

int n,i,j,q;

int u,v;

vector<int> edge[maxn];

int fa[maxn],son[maxn],top[maxn],dep[maxn],id[maxn],sz[maxn];

int b[maxn];

void dfs1(int u,int depth){

int v,i,mx=-1;

son[u]=0;sz[u]=1;dep[u]=depth;

REP(i,edge[u].size()){

v=edge[u][i];

dfs1(v,depth+1);

sz[u]+=sz[v];

if (sz[v]>mx) mx=sz[v],son[u]=v;

}

}

void dfs2(int u,int x){

int v,i;

top[u]=x;id[u]=++tot;

if (son[u]) dfs2(son[u],x);

REP(i,edge[u].size()){

v=edge[u][i];

if (v==fa[u]||v==son[u]) continue;

dfs2(v,v);

}

}

int Query(int x,int y){//这里需要注意方向

node up,down;

int ret,mark1=0,mark2=0;

while (top[x]!=top[y]){

if (dep[top[x]]>dep[top[y]]){

up=merge(query(1,id[top[x]],id[x],1,tot),up);

x=fa[top[x]];

mark1=1;

}else {

down=merge(query(1,id[top[y]],id[y],1,tot),down);

y=fa[top[y]];

mark2=1;

}

}

if (dep[x]>dep[y]) up=merge(query(1,id[y],id[x],1,tot),up),mark1=1;

else down=merge(query(1,id[x],id[y],1,tot),down),mark2=1;

ret=max(up.downmx,down.upmx);

if (mark1&&mark2&&up.lval<down.lval) ret=max(ret,up.ldown+down.lup);

return ret;

}

int T,t;

int main(){

scanf("%d",&T);

FOR (t,1,T){

scanf("%d",&n);

FOR(i,1,n) edge[i].clear();tot=0;

FOR(i,1,n) scanf("%d",&b[i]);

FOR(i,2,n){scanf("%d",&fa[i]); edge[fa[i]].push\_back(i);}

dfs1(1,1);

dfs2(1,1);

FOR(i,1,n) a[id[i]]=b[i];

build(1,1,tot);

scanf("%d",&q);

printf("Case #%d:\n",t);

while (q--){

scanf("%d%d",&u,&v);

printf("%d\n",Query(u,v));

}

if (t!=T) puts("");

}

}

树链剖分求LCA

vector<int> edge[maxn];

int sz[maxn],fa[maxn],son[maxn],top[maxn],dep[maxn],id[maxn];//id没用

int tot=0;

void dfs1(int u,int depth){

int v,i,mx=-1;

sz[u]=1;dep[u]=depth;son[u]=0;

for(int v:edge[u]){

dfs1(v,depth+1);

sz[u]+=sz[v];

if (sz[v]>mx) mx=sz[v],son[u]=v;

}

}

void dfs2(int u,int x){

int v,i;

top[u]=x;id[u]=++tot;

if (son[u]) dfs2(son[u],x);

for (int v:edge[u]){

if (v==son[u]) continue;

dfs2(v,v);

}

}

int query(int x,int y){

while (top[x]!=top[y]){

if (dep[top[x]]<dep[top[y]]) swap(x,y);

x=fa[top[x]];

}

if (dep[x]>dep[y]) swap(x,y);

return x;

}

int len(int x,int y){

return dep[x]+dep[y]-dep[query(x,y)]\*2+1;//point

}

离线tarjin求LCA

vector<int> edge[maxn];

int fa1[maxn],fa2[maxn];

inline int getfa(int \*fa,int x){

if (fa[x]==x) return x;

return fa[x]=getfa(fa,fa[x]);

}

int n,m,q;

int i,k;

int u,v;

int ans[maxn];

vector<pair<int,int> > Q[maxn];//v,id

void dfs(int x){

int i;

for (int v:edge[x]){

dfs(v);

fa2[v]=x;

}

REP(i,Q[x].size())

if (fa2[Q[x][i].first]!=Q[x][i].first)

ans[Q[x][i].second]=getfa(fa2,Q[x][i].first);

}

void solve(){

REP(i,q){

scanf("%d%d%d",&k,&u,&v);

if (k==1){

if (getfa(fa1,u)!=getfa(fa1,v)) ans[i]=-1;

else{

if (u==v) ans[i]=u;

else{

Q[u].push\_back(make\_pair(v,i));

Q[v].push\_back(make\_pair(u,i));

}

}

}else{

edge[u].push\_back(v);

fa1[v]=u;

ans[i]=0;

}

}

FOR(i,1,n) if (fa1[i]==i) dfs(i);

REP(i,q) if (ans[i]) printf("%d\n",ans[i]);

}

倍增

void dfs(int x,int depth){

dep[x]=depth;

for (int v:edge[x]) dfs(v,depth+1);

}

int lca(int x,int y){

int i;

if (dep[x]<dep[y]) swap(x,y);

rREP(i,20) if (dep[x]-dep[y]>=1<<i) x=fa[x][i];

if (x==y) return x;

rREP(i,20) if (fa[x][i]!=fa[y][i]) x=fa[x][i],y=fa[y][i];

return fa[x][0];

}

int dis(int x,int y){

return dep[x]+dep[y]-2\*dep[lca(x,y)];

}

INIT:

FOR(i,2,n) rep(j,1,20) fa[i][j]=fa[fa[i][j-1]][j-1];

****最大团****

struct MAX\_CLIQUE {

static const int N=60;

bool G[N][N];

int n, Max[N], Alt[N][N], ans;

bool DFS(int cur, int tot) {

if(cur==0) {

if(tot>ans) {

ans=tot;

return 1;

}

return 0;

}

for(int i=0; i<cur; i++) {

if(cur-i+tot<=ans) return 0;

int u=Alt[tot][i];

if(Max[u]+tot<=ans) return 0;

int nxt=0;

for(int j=i+1; j<cur; j++)

if(G[u][Alt[tot][j]]) Alt[tot+1][nxt++]=Alt[tot][j];

if(DFS(nxt, tot+1)) return 1;

}

return 0;

}

int MaxClique() {

ans=0, memset(Max, 0, sizeof Max);

for(int i=n-1; i>=0; i--) {

int cur=0;

for(int j=i+1; j<n; j++) if(G[i][j]) Alt[1][cur++]=j;

DFS(cur, 1);

Max[i]=ans;

}

return ans;

}

};

MAX\_CLIQUE edge;

****最小树形图****

//不定根:新加一个节点，向所有点加一条INF的边，最后减一下即可

//主要思路:缩点

//输出路径思路:缩完点记录边,然后新建边记录等价关系

struct node{

int u,v,val,id;//id->usedID

}edge[maxn];

int pre[maxn],len[maxn],vis[maxn],id[maxn];

struct used{

int pre,id;//original

}U[maxn\*20];//edges

int UID[maxn],used[maxn\*20];

int OK[maxn];

int solve(int root,int n,int m){

int ret=0,i,tot=m,em=m;

REP(i,m) edge[i].id=U[i].id=i;

while (1){

FOR(i,1,n) len[i]=INF,vis[i]=0,id[i]=0;

REP(i,m) if (edge[i].u!=edge[i].v&&edge[i].val<len[edge[i].v]){

pre[edge[i].v]=edge[i].u;

len[edge[i].v]=edge[i].val;

UID[edge[i].v]=edge[i].id;

}

FOR(i,1,n) if (i!=root&&len[i]==INF) return -1;

int cnt=0;len[root]=0;

FOR(i,1,n){

if (i!=root) used[UID[i]]++;

ret+=len[i];int v;

for(v=i;vis[v]!=i&&!id[v]&&v!=root;v=pre[v]) vis[v]=i;

if (v!=root&&!id[v]){

cnt++;id[v]=cnt;

for (int u=pre[v];u!=v;u=pre[u]) id[u]=cnt;

}

}if (!cnt) break;

FOR(i,1,n) if (!id[i]) id[i]=++cnt;

REP(i,m){

int v=edge[i].v;

edge[i].u=id[edge[i].u];edge[i].v=id[edge[i].v];

if (edge[i].u==edge[i].v) edge[i--]=edge[--m];

else {U[tot].id=edge[i].id;U[tot].pre=UID[v];edge[i].id=tot++;edge[i].val-=len[v];}

}n=cnt;root=id[root];

}

rrep(i,em,tot) if (used[i]){

used[U[i].id]++;

used[U[i].pre]--;

}

return ret;

}

int main(){

freopen("input.txt","r",stdin);

freopen("output.txt","w",stdout);

int n,m,root;

int i,j,k;

scanf("%d%d",&n,&m);

REP(i,m) scanf("%d%d%d",&edge[i].u,&edge[i].v,&edge[i].val);

REP(i,m) OK[i]=edge[i].val;

int ans=solve(1,n,m);

printf("%d\n",ans);

if (ans!=-1){

REP(i,m) if (OK[i]&&used[i]) printf("%d ",i+1),ans--;

if (ans) printf("\n%d\n",ans);

}

}

****一般图最大匹配 带花树****

//缩奇环

int n,m;

vector<int> edge[maxn];

bool inQueue[maxn];

int belong[maxn];

int getbelong(int x){

if (belong[x]==x) return x;

return belong[x]=getbelong(belong[x]);

}

int match[maxn],nxt[maxn],mark[maxn],vis[maxn];

int cnt;

queue<int> Q;

int used[maxn];

int lca(int u,int v){

cnt++;

while(1){

u=getbelong(u);

if (vis[u]==cnt) return u;

vis[u]=cnt;

u=nxt[match[u]];

if (v) swap(u,v);

}

}

void merge(int u,int p){

while(u!=p){

int mu=match[u],v=nxt[mu];

if (getbelong(v)!=p) nxt[v]=mu;

if (mark[mu]==2) mark[mu]=1,Q.push(mu);

if (mark[v]==2) mark[v]=1,Q.push(v);

int x,y;

x=getbelong(u),y=getbelong(mu);

if (x!=y) belong[x]=y;

x=getbelong(mu),y=getbelong(v);

if (x!=y) belong[x]=y;

u=v;

}

}

void solve(int s){//增广

int i;

FOR(i,1,n) belong[i]=i,mark[i]=nxt[i]=0;

while (Q.size()) Q.pop();

Q.push(s);

while (Q.size()){

if (match[s]) return;

int u=Q.front();Q.pop();

for (int v:edge[u]){

if (match[u]==v) continue;

if (getbelong(u)==getbelong(v)) continue;

if (mark[v]==2) continue;//T型点

if (mark[v]==1){//S型点,缩点

int p=lca(u,v);

if (getbelong(u)!=p) nxt[u]=v;

if (getbelong(v)!=p) nxt[v]=u;

merge(u,p);

merge(v,p);

}else if (!match[v]){//增广

nxt[v]=u;

for (int x=v;x;){

int y=nxt[x],xx=match[y];

match[x]=y;match[y]=x;

x=xx;

}break;

}else{

nxt[v]=u;

mark[match[v]]=1;Q.push(match[v]);

mark[v]=2;

}

}

}

}

bool E[maxn][maxn];

int ans;

int main(){

scanf("%d%d",&n,&m);

int i;

while (m--){

int u,v;

scanf("%d%d",&u,&v);

if (u!=v&&!E[u][v]){

edge[u].push\_back(v);

edge[v].push\_back(u);

E[u][v]=E[v][u]=1;

}

}

memset(match,0,sizeof(match));

FOR(i,1,n) if (!match[i]) solve(i);

FOR(i,1,n) if (match[i]) ans++;

ans/=2;

printf("%d\n",ans);

FOR(i,1,n) printf("%d ",match[i]);

}

# 数学相关

void getPrim(){//线性的筛法求素数

int o=0;

register int i,j;

FOR(i,2,Nmax){

if (!prim[i]) prim[++prim[0]]=i;

FOR(j,1,prim[0]){

if (i\*prim[j]>Nmax) break;

prim[i\*prim[j]]=1;

if (i%prim[j]==0) break;

}

}

}

逆元

int n,m;

int i,j,k;

**//d==1时存在逆元 //(x+p)%p为逆元//d!=1可用num\*a/d来代替逆元(num|d)**

void exgcd(LL a,LL b,LL &d,LL &x,LL &y){

if (!b) {d=a;x=1;y=0;}

else {exgcd(b,a%b,d,y,x);y-=a/b\*x;}

}

int getinv(int n){

if (n==1) return 1;

return (M-M/n)\*(getinv(M%n))%M;

}

LL inv1[1000002];

LL inv2[1000002];

LL inv3[1000002];

int main()

{

LL d,x,y;

// FOR(i,1,1000000) {exgcd(i,M,d,inv[i],y); inv1[i]=(inv[i]+M)%M;}

// FOR(i,1,1000000) inv2[i]=getinv(i);

inv3[0]=inv3[1]=1;

FOR(i,2,1000000) inv3[i]=(M-M/i)\*inv3[M%i]%M;

// FOR(i,1,1000000) printf("%lld ",inv3[i]\*i%M);

}

**C(n,n)//DP:** **C[i][j]=(C[i-1][j-1]+C[i][j-1])%M;**

int n,m;

int i,j,k;

LL inv[1000002];//inverse

LL fac[1000002];//Factorial

void init(){

int i;

fac[0]=1;

FOR(i,1,1000000) fac[i]=i\*fac[i-1]%M;

inv[0]=inv[1]=1;

FOR(i,2,1000000) inv[i]=(M-M/i)\*inv[M%i]%M;

FOR(i,1,1000000) inv[i]=inv[i]\*inv[i-1]%M;

}

LL C(int n,int m){

return fac[n]\*inv[m]%M\*inv[n-m]%M; }

int main()

{

LL d,x,y;

init();

printf("%d",C(10,3));

}

**Lucas Cnn**

int n,m;

int i,j,k;

LL inv[1000002];//inverse

LL fac[1000002];//Factorial

void init(){

int i;

fac[0]=1;

FOR(i,1,1000000) fac[i]=i\*fac[i-1]%MOD;

inv[0]=inv[1]=1;

FOR(i,2,1000000) inv[i]=(MOD-MOD/i)\*inv[MOD%i]%MOD;

FOR(i,1,1000000) inv[i]=inv[i]\*inv[i-1]%MOD;

}

LL C(int n,int m){

return fac[n]\*inv[m]%MOD\*inv[n-m]%MOD;

}

LL lucas(LL n,LL m){//注意MOD不能太大=\_=!

return m==0?1:1ll\*C(n%MOD,m%MOD)\*lucas(n/MOD,m/MOD)%MOD;

}

int main()

{

LL d,x,y;

init();

printf("%d",lucas(10,3));

}

数位dp

**对于某一个问题，f[i][j][k][l]表示i位,第一位j,k=0/1(表示是否满足条件),余数或者其他为l时的情况个数**

LL n,m;

LL dp[20][3];//0:

LL i,j,k;

void init(){

memset(dp,0,sizeof(dp));

dp[0][0]=1;

FOR(i,1,10){

dp[i][0]=dp[i-1][0]\*9-dp[i-1][1];//okay

dp[i][1]=dp[i-1][0];//2......

dp[i][2]=dp[i-1][0]+dp[i-1][1]+dp[i-1][2]\*10;//not okay

}

}

int A[20];

int calc(int a){

int sum=a;

int m=0;

int ans=0;

bool flag=false;

while(a){

A[++m]=a%10;

a/=10;

}

A[m+1]=0;

for (int i=m;i>=1;i--){

ans+=dp[i-1][2]\*A[i];

if (flag){

ans+=dp[i-1][0]\*A[i];

}else{

if (A[i]>4) ans+=dp[i-1][0];

if (A[i+1]==6&&A[i]>2) ans+=dp[i][1];

if (A[i]>6) ans+=dp[i-1][1];

if (A[i]==4||A[i]==2&&A[i+1]==6) flag=1;

}

}

if (flag) ans++;

return sum-ans;

}

int main(){

int a,b;

int l,r;

init();

while (~scanf("%d%d",&l,&r)&&(l||r)) printf("%d\n",calc(r)-calc(l-1));

}

博弈：NIM,SG

**选择的最多次数,main中为异或!=0**

int sg[maxm+2];//打表~~~

**/\*这个是状态和剩余个数有关的**

map<int,int> Hash;

int SG(int mask){

if (Hash.count(mask)) return Hash[mask];

set<int> mex;

for (int i=0;i<maxm;++i){

if (!((mask>>i)&1)) continue;//continue

int tp=mask;

for (int j=i;j<maxm;j+=i+1)//change

if ((mask>>j)&1) tp^=1<<j;

mex.insert(SG(tp));//dfs

}

int ret=0;

for (;mex.count(ret);++ret);

return Hash[mask]=ret;

}\*/

**/\*这个是状态和剩余个数无关的**

map<LL,int> Hash[62];

int SG(int x,LL mask){

// printf("%d %d\n",x,mask);

if (Hash[x].count(mask)) return Hash[x][mask];

set<int> mex;

for (int i=1;i<=x;++i){

if ((mask>>(i-1))&1) continue;//continue

int tp=mask;

tp^=1<<(i-1);//change

mex.insert(SG(x-i,tp));//dfs

}

int ret=0;

for (;mex.count(ret);++ret);

return Hash[x][mask]=ret;

}\*/

int main(){

sg[0]=0;

}

FFT、NTT、FWT、FMT

**FFT：**

struct complex{

double a,b;

complex(double \_a=.0,double \_b=.0):a(\_a),b(\_b){}

complex operator+(const complex x)const{return complex(a+x.a,b+x.b);}

complex operator-(const complex x)const{return complex(a-x.a,b-x.b);}

complex operator\*(const complex x)const{return complex(a\*x.a-b\*x.b,a\*x.b+b\*x.a);}

};

void fft(complex \*A,int len,int inv){//抄的板子

int i,j,k;

for (i=1,j=len/2;i<len-1;i++){

if (i<j) swap(A[i],A[j]);

k=len/2;

while(j>=k){

j-=k;

k/=2;

}if (j<k) j+=k;

}

for(i=2;i<=len;i<<=1){

complex wn(cos(-inv\*2\*pi/i),sin(-inv\*2\*pi/i));

for (j=0;j<len;j+=i){

complex w(1.0,0.0);

for (k=j;k<(j+i/2);k++){

complex a=A[k],b=w\*A[k+i/2];

A[k]=a+b;

A[k+i/2]=a-b;

w=w\*wn;

}

}

}

if (inv==-1) REP(i,len) A[i].a/=len;

}

complex x1[maxn],x2[maxn];

char a[maxn],b[maxn];

int ans[maxn];

int main(){

int T;

int i,j,k;

// printf("%lf\n",pi);

scanf("%d",&T);

while (T--){

scanf("%s%s",a,b);

bool mark=0;;

int len1=strlen(a),len2=strlen(b),len=1;

if (a[0]=='-') {REP(i,len1) a[i]=a[i+1];len1--;mark^=1;}

if (b[0]=='-') {REP(i,len2) b[i]=b[i+1];len2--;mark^=1;}

while(len<=len1+len2+1) len<<=1;

REP(i,len1) x1[i]=complex(a[len1-i-1]-'0',0);

rep(i,len1,len) x1[i]=complex(0,0);

REP(i,len2) x2[i]=complex(b[len2-i-1]-'0',0);

rep(i,len2,len) x2[i]=complex(0,0);

fft(x1,len,1);fft(x2,len,1);

REP(i,len) x1[i]=x1[i]\*x2[i];

fft(x1,len,-1);

REP(i,len) ans[i]=x1[i].a+0.5;

REP(i,len) ans[i+1]+=ans[i]/10,ans[i]%=10;

while (ans[len-1]<=0&&len-1>0) len--;

if (mark) putchar('-');

rREP(i,len) putchar(ans[i]+'0');

puts("");

}

}

**NTT：**

const LL MOD=2281701377;

const LL g=3;

LL mul ( LL x , LL y ) {

return x\*y%MOD;

// return ( x \* y - ( long long ) ( x / ( long double ) MOD \* y + 1e-3 ) \* MOD + MOD ) % MOD ;

}

LL poww(LL a,LL b){

LL ret=1;

for (;b;b>>=1ll,a=mul(a,a))

if (b&1) ret=mul(ret,a);

return ret;

}

void ntt(LL \*A,int len,int inv){//抄的板子

int i,j,k;

for (i=1,j=len/2;i<len-1;i++){

if (i<j) swap(A[i],A[j]);

k=len/2;

while(j>=k){

j-=k;

k/=2;

}if (j<k) j+=k;

}

for(i=2;i<=len;i<<=1){

LL wn=poww(g,(MOD-1)/i);

if (inv==-1) wn=poww(wn,MOD-2);

for (j=0;j<len;j+=i){

LL w=1;

for (k=j;k<(j+i/2);k++){

LL a=A[k],b=mul(w,A[k+i/2]);

A[k]=(a+b)%MOD;

A[k+i/2]=(a-b+MOD)%MOD;

w=mul(w,wn);

}

}

}

if (inv==-1){

LL vn=poww(len,MOD-2);

REP(i,len) A[i]=mul(A[i],vn);

}

}

**FWT：**

void fwt(LL \*A,int len,int inv)//对拍对了

{

int i,j,k;

int div=powMM(2ll,M-2);

for(i=2;i<=len;i<<=1){

for(j=0;j<len;j+=i){

for(k=j;k<j+i/2;k++){

if (inv==1){

LL a=A[k],b=A[k+i/2];

A[k]=(a+b)%M;

A[k+i/2]=(a-b+M)%M;

//xor:a[k]=x+y,a[k+i/2]=(x-y+mod)%mod;

//and:a[k]=x+y;

//or:a[k+i/2]=x+y;

}else{

LL a=A[k],b=A[k+i/2];

A[k]=(a+b)\*div%M;

A[k+i/2]=(a-b+M)%M\*div%M;

//xor:a[k]=(x+y)/2,a[k+i/2]=(x-y)/2;

//and:a[k]=x-y;

//or:a[k+i/2]=y-x;

}

}

}

}

}

子集卷积(的分治套路)

**//http://acm.hdu.edu.cn/showproblem.php?pid=6057**

**//很容易卡T...3^18也许能过 //这个比2^nlog^2(n=19)的慢了快5倍**

**//这种思路这种题都能用**

int T;

int n;

ULL A[1<<19|7],B[1<<19|7];

ULL C[1<<22|7];

ULL ans,mul;

inline void solve(ULL \*A,ULL \*B,ULL \*C,int len){

int i;

if (len==2) {C[1]=A[0]\*B[1];C[0]=2\*A[1]\*B[1]+A[0]\*B[0];return;}//这样要快

// if (len==1) {C[0]=1ll\*A[0]\*B[0]%M;return;}

ULL \*D=C+len;

len>>=1;

solve(A,B,D,len);//这里A和B可能是要算的,这种情况下这就是正解

solve(A,B+len,D+len,len);

solve(A+len,B+len,D+len+len,len);

REP(i,len){

C[i+len]=D[i+len];

(C[i]=D[i+len+len]\*2+D[i])>INFF&&(C[i]%=M);

}

}

int main()

{

int i;

scanf("%d",&n);

REP(i,(1<<n)) read(A[i]);

REP(i,(1<<n)) read(B[i]);

solve(A,B,C,1<<n);

mul=1;

REP(i,(1<<n)) {

// printf("%d ",C[i]);

C[i]%=M;

ans+=C[i]\*mul;

if(ans>INFF) ans%=M;

mul=1526\*mul%M;

}ans%=M;

printf("%llu\n",ans);

return 0;

}

**//真\*子集卷积by TLS**

const int maxn = 1 << 19 | 1, mod = 998244353, seed = 1526;

int n, all, bit[maxn], a[maxn], b[maxn], ans;

inline void mod\_inc(int &x, int y) {

(x += y) >= mod && (x -= mod);

}

int main() {

while(scanf("%d", &n) == 1) {

all = (1 << n) - 1;

for(int i = 0; i <= all; ++i)

scanf("%d", a + i);

for(int i = 0; i <= all; ++i)

scanf("%d", b + i);

bit[0] = 1;

for(int i = 1; i <= all; ++i) {

bit[i] = bit[i >> 1] << (i & 1);

a[i] = (LL)a[i] \* bit[i] % mod;

}

ans = 0;

for(int i = all; i >= 0; --i) {

int msk = all ^ i, tim = 0;

ULL cnt = 0;

for(int j = msk; j; j = (j - 1) & msk) {

cnt += (ULL)a[j] \* b[i | j];

(++tim) == 18 && (tim = 0, cnt %= mod);

}

cnt += (ULL)a[0] \* b[i];

cnt %= mod;

ans = ((LL)seed \* ans + cnt) % mod;

}

printf("%d\n", ans);

}

return 0;

}

高斯消元

**正整数版//有的(比如有负数)得求逆元保证不爆**

LL n,m;

LL i,j,k;

LL a[maxn][maxn];

LL ans;

int main(){

while (~scanf("%I64d%I64d",&n,&m)){

REP(i,n)

REP(j,n) scanf("%I64d",&a[i][j]);

ans=1;

REP(i,n){

rep(j,i+1,n){

int x=i,y=j;

while (a[y][i]){

LL t=a[x][i]/a[y][i];

rep(k,i,n) a[x][k]=(a[x][k]-a[y][k]\*t)%m;

swap(x,y);

}

if (x!=i){

rep(k,i,n) swap(a[i][k],a[x][k]);

ans=(-ans+m)%m;

}

}

ans=ans\*a[i][i]%m;

ans=(ans+m)%m;

}

printf("%I64d\n",ans);

}

}

求凸包

struct node{

double x,y;

bool operator <(const node &a) const{

if (y<a.y) return 1; if (y>a.y) return 0;

return x<a.x;

}

}p[maxn],P[maxn];

inline double X(node A,node B,node C){ return (B.x-A.x)\*(C.y-A.y)-(B.y-A.y)\*(C.x-A.x); }

inline double len(node A,node B){ return sqrt((A.x-B.x)\*(A.x-B.x)+(A.y-B.y)\*(A.y-B.y)); }

bool cmp(node A,node B){

double cp=X(p[0],A,B);

if (cp>0) return 1;if (cp<0) return 0;

return len(p[0],A)<len(p[0],B);

}

int n,m;

double t;

int tot;

int i,j,k;

double ans;//求长度的

int main(){

while (~scanf("%d%lf",&n,&t)){

REP(i,n) scanf("%lf%lf",&p[i].x,&p[i].y);

// ans=2\*pi\*t;//没啥用//=0

if (n==1) printf("%.0lf",ans);

else if (n==2) printf("%.0lf",ans+len(p[0],p[1]));

else {

REP(i,n) if (p[i]<p[0]) swap(p[0],p[i]);

sort(p+1,p+n,cmp);

P[0]=p[0];

P[1]=p[1];

tot=1;

rep(i,2,n){

while (tot>0&&X(P[tot-1],P[tot],p[i])<=0) tot--;

P[++tot]=p[i];

}

REP(i,tot) ans+=len(P[i],P[i+1]);

ans+=len(P[0],P[tot]);

printf("%.0lf",ans);

}puts("");

}

}