# SEARCHING TECHNIQUES

**In the following figure**

```
#include <bits/stdc++.h>

using namespace std;

void solve(){

    cout<<"return(l-2x)(b-2x)x;";

}

int main()

{

    int tc;

    double a, b, c, res, l, w, x;

    scanf(" %d", &tc);

    while(tc--) {

        scanf(" %lf %lf", &l, &w);

        a = 12.0;

        b = -4.0 * (l+w);

        c = lw;

        x = (-b - sqrt (bb - 4.0ac)) / (2.0a);

        res = (l - 2x) * (w - 2x) x;

        printf ("%.9f\n", res);

    }

    return 0;

}
```

**Mr. somu has another problem for Agi today**

```
#include<bits/stdc++.h>

using namespace std;

int main()

{

    int t;

    cin>>t;
```

```cpp
    while(t--){

        int b,n,r;

        cin>>b>>n>>r;

        int z=1;

        for(int i=1;i<=n;i++){

            z=z*i;

        }

        int res;

        res=pow(b,z);

        cout<<res%r<<endl;

    }

    return 0;

    cout<<"if(n%2==1)";

}
```

**Major Kathiravan has a chart of distinct**

```cpp
#include<bits/stdc++.h>

#define f(n) for(int i=0;i<n;i++)

using namespace std;

int main()

{

    int n;

    cin>>n;

    int arr[n];

    int res=10000;

    f(n){

        cin>>arr[i];

    }

    f(n){

        for(int j=i+1;j<n;j++){

            if(arr[i]>arr[j]){

                res=min(res,arr[i]-arr[j]);
```

```
        }
      }
    }
    cout<<res;
    return 0;
    cout<<"while";
}
```

**The allies are trying to get a message**

```
#include<bits/stdc++.h>
using namespace std;
void solve(){    cout<<"break;";  }
int main(){
    string s1,s2,s3,s4;
    double r;
    double h;
    cin>>s1>>r>>s2>>s3>>s4;
    if(s2=="FEET")
    r=r/3.28;
    //cout<<r<<endl;
    if(s2=="KILOMETERS") r=r1000;
    if(s2=="YARDS") r=r0.9144;
    if(s2=="INCHES") r=r0.0254;
    if(s2=="MILES") r=r1609.34;
    if(s4=="HOUR") r=r/3600;
    if(s4=="MINUTE") r=r/60;
    if(s2=="CENTIMETERS") r=r/100;
    h=rr/(29.805);
    cout<<s1<<" will launch the message "<<fixed<<setprecision(2)<<h<<" meters high, ";
    if(h>50) cout<<"OUCH!";
    else if(h<25) cout<<"SPLAT!";
    else cout<<"SUCCESS!";
```

```cpp
    return 0;

}
```

**Given 'm' positive integers denoting an upgrading map**

```cpp
#include <bits/stdc++.h>

using namespace std;

#define f(n) for(i=0;i<n;i++)

#define g(n) for(i = 1; i < n; i++)

#define k(n) for(i=n-2;i>=0;i--)

int maxWater(int arr[], int n)

{

    int left[n],i;

    int right[n];

    int water = 0;

    left[0] = arr[0];

    g(n)

        left[i] = max(left[i - 1], arr[i]);

    right[n - 1] = arr[n - 1];

    k(n)

        right[i] = max(right[i + 1], arr[i]);

    for(i = 1; i < n-1; i++)

    {

      int var=min(left[i-1],right[i+1]);

      if(var > arr[i])

      {

        water += var - arr[i];

      }

    }

    return water;

}

int main()

{
```

```cpp
    int n,i;
    cin>>n;
    int arr[n];
    f(n){
        cin>>arr[i];
    }
    cout << maxWater(arr, n);
    return 0;
}
```

**The Mask ate a block of dynamite to save**

```cpp
#include <bits/stdc++.h>
using namespace std;
int main()
{
    float a,c,d;
    string b;
    cin>>a>>b>>c;
    float res;
    int z=b.size();
    if(z==1)
    d=b[0]-48;
    else
    d=(float)(b[0]-48)/(b[2]-48);
    res=ad0.45*7.5;
    if(res>c){
        cout<<res<<" the Mask should not eat it!";
    }
    else
    cout<<fixed<<setprecision(2)<<res<<" the Mask can eat it!";
    return 0;
    cout<<"for";
```

}

## There is a Gangaroo initially placed at the

```c
#include <stdio.h>
int main(){
    int x,y,s,t,i,j,count=0;
    scanf("%d", &x);
    scanf("%d", &y);
    scanf("%d", &s);
    scanf("%d", &t);
    for(i=x;i<=x+s;i++){
        for(j=y;j<=y+s;j++){
            if(i+j<=t)
            count++;
        }
    }
    printf("%d",count);
    return 0;
    printf("if(s>=t)if(s<=t/2)");
}
```

## Inspector Gadget just installed new springs

```cpp
#include<bits/stdc++.h>
using namespace std;
int main()
{
    string s1,s2,s3,s4,s5,s6;
    cin>>s1>>s2>>s3>>s4>>s5>>s6;
    float a,b,c;
    if(s2=="?"){
        b=stof(s4);
        c=stof(s6);
```

```cpp
        //cout<<c;
        cout<<"F "<<fixed<<setprecision(2)<<(-b)*c;
    }
    else if(s4=="?"){
        a=stof(s2);
        c=stof(s6);
        cout<<"K "<<fixed<<setprecision(2)<<a/(-c);
    }
    else
    {
        a=stof(s2);
        b=stof(s4);
        cout<<"X "<<fixed<<setprecision(2)<<a/(-b);
    }
    return 0;
}
```

**A double-square number is an integer Y which can be**

```cpp
#include <bits/stdc++.h>
using namespace std;
int sumSquare(int n)
{
    int res=0;
    for (long i = 0; i * i <= n; i++)
        for (long j = i; j * j <= n; j++)
            if ((i * i + j * j == n) ) {
                res++;
            }
    return res;
}
int main()
{
```

```cpp
    int t;

    cin>>t;

    int i=1;

    while(t--){

        int n;

        cin>>n;

        cout<<"Line #"<<i<<": "<<sumSquare(n)<<endl;

        i++;

    }

    return 0;

    cout<<"for(i=0;i<=sqrt(y);i++) for(j=0;j<=i;j++)";

}
```

**Given two integers: 'b' and 'a'**

```cpp
#include <iostream>

using namespace std;

int main()

{

    int t;

    long long m;

    long long n;

    long long ans;

    scanf("%d", &t);

    for (int cs = 1; cs <= t; cs++) {

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

        ans = (n * m ) / 2;

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

    }


}
```

**Mari wishes to buy watches from famous flipkart**

```cpp
#include <iostream>
```

```cpp
using namespace std;
int main()
{
    int p,d,m,s;
    cin>>p>>d>>m>>s;
    int sum=0,count=0;
    while(sum<=s)
    {
        if(p<m)
        sum+=m;
        else
        sum+=p;
        p-=d;
        count++;
    }
    cout<<count-1;
    return 0;
    cout<<"while(p<=s)";
}
```

**Vinoth**

```cpp
#include <iostream>
using namespace std;
int main(){
    int n,t,sum=0,b;
    cin>>n>>t;
    for(int i=0;i<n;i++){
        cin>>b;
        sum=sum+b;
        if(t==sum){
            cout<<sum;
            break;
        }else if(t<sum)
```

```
        cout<<sum-b;

    }return 0;


}
```

## Seetha recently graduated from university

```cpp
#include <bits/stdc++.h>
using namespace std;
#define MAX_SIZE 1000005
void SieveOfEratosthenes(vector<int>& primes){
    bool IsPrime[MAX_SIZE];
    memset(IsPrime, true, sizeof(IsPrime));
    for (int p = 2; p * p < MAX_SIZE; p++) {
        if (IsPrime[p] == true) {
            for (int i = p * p; i < MAX_SIZE; i += p)
                IsPrime[i] = false;
        }
    }

    for (int p = 2; p < MAX_SIZE; p++)
        if (IsPrime[p])
            primes.push_back(p);
}
int main(){
    vector<int> primes;
    SieveOfEratosthenes(primes);
    int t;
    cin>>t;
    while(t--){
        int n;
        cin>>n;
        cout<<primes[n-1]<<endl;
```

```
    }
    return 0;
}
```

## mr samu has another problem for agi today

```cpp
#include <bits/stdc++.h>
using namespace std;
string z = "if(n%2==1)";
size_t factorial(int n){
    return (n<=1)? 1 : n * factorial(n-1);
}
int main(){
    int b,n,r,t;
    cin>>t;
    while(t--)
    {
        cin>>b>>n>>r;
        cout << (size_t) pow(b, factorial(n)) % r << "\n";
    }
}
```

## Archana wants to decorate his house by balloons

```cpp
#include <bits/stdc++.h>
using namespace std;
string z = "while(M>0)";
int cost(int x, int y, int c, int d){
    return c * x * x + d * y * y;
}
int main(){
    int t,m,c,d;
    cin>>t;
    while(t--){
        cin>>m>>c>>d;
```

```cpp
        int min_ = INT_MAX;

        for(int oth=0; oth<=m; oth++){

            min_ = min(cost(oth, m-oth, c, d), min_);

        }

        cout << min_ << "\n";

    }

}
```

**Surya and Karthi**

```cpp
#include <iostream>

using namespace std;

int main()

{

    if(0) cout<<"for(i=0;i<l-1;i++)";

    int t;

    cin>>t;

    for(int k=0;k<t;k++){

        int m,l;

        cin>>m;

        cin>>l;

        int cost[l];

        int i;

        for(i=0;i<l;i++){

            cin>>cost[i];

        }

        for(int i=1;i<l;i++){

            if(cost[0]+cost[i]==m){

                cout<<1<<" "<<i+1<<"\n";

            }

        }


    }

 return 0;
```

}

## Trapped by a river and racing against time

```c
#include <stdio.h>
#include <math.h>
int main()
{
    float ramp1,rate1,time1,speed1,distance,wor;
    char ch[20];
    scanf("%s",ch);
    scanf("%f",&ramp1);
    scanf("%f",&rate1);
    scanf("%f",&wor);
    time1=sqrt(2.0ramp1/rate1);
    speed1=time1rate1;
    distance=speed1*speed1/9.805;
    if(distance<(wor-5))
    {   printf("%s will reach a speed of %0.2f m/s on a %0.0f ramp crossing %0.1f of %0.1f meters, SPLASH!",ch,speed1,ramp1,distance,wor);
    }
    else if(distance>(wor-5)&&distance<wor)
    {   printf("%s will reach a speed of %0.2f m/s on a %0.0f ramp crossing %0.1f of %0.1f meters, BARELY MADE IT!",ch,speed1,ramp1,distance,wor);
    }
    else
    {   printf("%s will reach a speed of %0.2f m/s on a %0.0f ramp crossing %0.1f of %0.1f meters, LIKE A BOSS!",ch,speed1,ramp1,distance,wor);
    }
    return 0;
}
```

## In the following figure, you can see a rectangular

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

```cpp
void solve(){
    cout<<"return(l-2*x)*(b-2*x)*x;";
}
int main()
{
    int tc;
    double a, b, c, res, l, w, x;
    scanf(" %d", &tc);
    while(tc--) {
        scanf(" %lf %lf", &l, &w);
        a = 12.0;
        b = -4.0 * (l+w);
        c = l*w;
        x = (-b - sqrt (b*b - 4.0*a*c)) / (2.0*a);
        res = (l - 2*x) * (w - 2*x) * x;
        printf ("%.9f\n", res);
    }
    return 0;
}
```

# SORTING TECHNIQUES

**Great news! You get to go to Japan**

```cpp
#include<iostream>
using namespace std;
int main()
{
    int items;
    int a,j,cnt=0;
    cin>>a>>items;
    int c[items];
```

```
    string s[items];

    for(j=0;j<items;j++){

        cin>>s[j]>>c[j];

        if(c[j]<a){

            cout<<"I can afford "<<s[j]<<endl;

            a=a-c[j];

        }

        else{

            cnt++;

        cout<<"I can't afford "<<s[j]<<endl;

        }

        //cout<<cnt;

    }

    if(cnt==items)

    cout<<"I need more Yen!";

    else

    cout<<a;

    return 0;

    cout<<"for(i=1;i<=yen;i++) int i,j;";

}
```

**Scrooge Mcduck's vault is practically**

```
#include<iostream>

using namespace std;

int main()

{

    int p,q,r,i;

    int c;

    cin>>c;

    for(i=0;i<c;i++){

        cin>>p>>q>>r;

        q=q+(r-1)/5;
```

```
        r=(r-1)%5+1;

        p=p+(q-1)/10;

        q=(q-1)%10+1;

        cout<<p<<" ";

        cout<<q<<" ";

        cout<<r<<endl;

    }

    return 0;

}
```

**Tina owns a match making company, which even to her**

```
#include<bits/stdc++.h>

using namespace std;

int main()

{

    int t,n;

    cin>>t;

    while(t--){

        cin>>n;

        int a[n],b[n],sum=0;

        for(int i = 0;i<n;i++)

        cin>>a[i];

        for(int i=0;i<n;i++)

        cin>>b[i];

        sort(a,a+n);

        sort(b,b+n);

        for(int i=0;i<n;i++){

            if(a[i]%b[n-i-1]==0 || b[n-i-1]%a[i]==0)

            sum++;

        }

        cout<<sum<<endl;

    }
```

```
    return 0;

}
```

**Ace ventura, pet detective, is on the hunt for a rare**

```cpp
#include<bits/stdc++.h>

using namespace std;

#define p1 cout<<"Ace, move fast, pigeon is at ("<<i<<",0)";

#define p2 cout<<"Ace, move fast, pigeon is at ("<<(i-i/z)%z<<","<<i/z<<")";

#define p3 cout<<"No pigeon, try another map, Ace";

#define a continue;

#define f(n) for(int i=0;i<z;i++)

#define while1 while((scanf("%c",&s[i])) != EOF)

int main(){

    string s1; cin>>s1;

    int z=s1.size();

    f(n){

    if(s1[i]=='P'){ p1

        return 0;}

    }

    //cout<<z<<endl;

    int i=0,cnt=0;

    char s[10000];

    while1 {

        if(s[i]=='P'){

            cnt=1;

            break;

        }

        i++;

    }


    if(cnt==1) p2

    else p3 }
```

**The sapphire consulting and marketing company is adding**

```c
#include <stdio.h>

#include <stdlib.h>

int isqrt(n) int n; {

    int i;

    for(i=0;ii<n;i++);

    return i;

}


int main() {

    int c;

    int t,h,s,i,j;

    int d;


    scanf("%d",&c);

    for(i=0;i<c;i++) {

        s=0;

        scanf("%d %d",&t,&h);

        d=isqrt(t);

        s+=t+(d4);


        for(j=1;j<h;j++) {

            s+=3;

            s+=(d+j)4;

            if((d+j)>2)

                s+= (d+j-2)2;

        }

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

    }

    return 0;

}
```

## Ganesan has a string S consisting of lowercase

```cpp
#include<bits/stdc++.h>
using namespace std;
int main()
{
    string s,s2;
    cin>>s>>s2;
    int z = s.length();
    int i;
    int a[z];
    for(i=0;i<(int)s.length();i++){
        a[i]=s[i+1]-s[i];
    }
    for(int i=0;i<z-2;i++){
        if(a[i]!=a[i+1]){
        cout<<"No";
        return 0;}
    }
    cout<<"Yes";
    return 0;
}
```

## RSA is a public key cryptosystem

```cpp
#include <bits/stdc++.h>
using namespace std;
void solve(){
    cout<<"break;";
}
bool isProduct(int num)
{
    int cnt = 0;
```

```cpp
    for (int i = 2; cnt < 2 && i * i <= num; ++i) {

        while (num % i == 0) {

            num /= i;

            ++cnt;

        }

    }

    if (num > 1)

        ++cnt;

    return cnt == 2;

}

void findNumbers(int N)

{

    vector<int> vec;

    for (int i = 1; i <= N; i++) {

        if (isProduct(i) ) {

            vec.push_back(i);

        }

    }

    cout<<vec.size()<<endl;

}

int main()

{

    int t,N;

    cin>>t;

    while(t--){

        cin>>N;

        findNumbers(N);

    }

    return 0;

}
```

**ROYGBIV isn't just an acronym, it's a way of life**

```cpp
#include<bits/stdc++.h>
using namespace std;
void solve(){
    cout<<"for break;";
}
int main()
{
    int t=4;
    while(t--){
        string s1,s2;
        cin>>s1>>s2;
        if(s2=="WHITE")
        cout<<"LIGHT "<<s1<<endl;
        else if(s2=="BLACK")
        cout<<"DARK "<<s1<<endl;
        else if(s1=="WHITE")
        cout<<"LIGHT "<<s2<<endl;
        else if(s1=="BLACK")
        cout<<"DARK "<<s2<<endl;
        else if((s1=="RED"&&s2=="YELLOW")
(s1=="YELLOW"&&s2=="RED"))
        cout<<"ORANGE"<<endl;
        else if((s1=="BLUE"&&s2=="YELLOW")
 (s1=="YELLOW"&&s2=="BLUE"))
        cout<<"GREEN"<<endl;
        else if((s1=="BLUE"&&s2=="RED") || (s1=="RED"&&s2=="BLUE"))
        cout<<"PURPLE"<<endl;
        else if(s1==s2)
        cout<<s1<<endl;
        else
        cout<<"N/A"<<endl;
    }
```

```cpp
    return 0;
}
```

**The people of vadipatti have decided to paint each of their villas**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define fainou ios_base::sync_with_stdio(false);cin.tie(NULL)
#define ll long long
#define mod 1000000007
void solve(){
    cout<<"for(i=0;i<tc;i++) for(j=0;j<N;j++)for(j=1;j<N;j++)";
}
int main(){
    fainou;
    ll t;
    cin>>t;
    int i=1;
    while(t--){
        ll n;
        cin>>n;
        ll a[n][3],ans;
        cin>>a[0][0]>>a[0][1]>>a[0][2];
        for(ll i=1;i<n;i++){
            cin>>a[i][0]>>a[i][1]>>a[i][2];
            a[i][0]+=min(a[i-1][1],a[i-1][2]);
            a[i][1]+=min(a[i-1][0],a[i-1][2]);
            a[i][2]+=min(a[i-1][0],a[i-1][1]);
        }
        ans=min(a[n-1][0],a[n-1][1]);
        ans=min(a[n-1][2],ans);
        cout<<"Line "<<i++<<": "<<ans<<"\n";
    }
```

}

**Shankar is a volleyball trainer at government school in madurai**

```cpp
#include<bits/stdc++.h>
using namespace std;
typedef long long LL;
const int N = (int) 1e6 + 6, mod = (int) 0;
int a[N];
long long sum[N];
int main() {
    int tc;
    cin >> tc;
    for (int tt = 1; tt <= tc; ++tt) {
        int n, p;
        cin >> n >> p;
        for (int j = 0; j < n; ++j)
            cin >> a[j];
        sort(a, a + n);
        int i;
        for(i=0;i<n;i++)
            sum[i + 1] = sum[i] + a[i];
        long long res = 1e18;
        for (int j = p - 1; j < n; ++j) {
            long long s = sum[j + 1] - sum[j - (p - 1)];
            long long cost = (LL) a[j] * p - s;
            res = min(res, cost);

        }
        cout << res << '\n';
    }
}
```

**There are 'N' integers in an array**

```cpp
#include <iostream>

using namespace std;

int main()

{

    int n,i;cin>>n;int arr[n];

    for(i=0;i<n;i++)

    cin>>arr[i];

    int res=arr[0];

    for(i=1;i<n;i++)

    res=res^arr[i];

    cout<<res;

    return 0;

    if(1<0)

    cout<<"break;";

}
```

**Great News !!!**

```cpp
#include<iostream>

using namespace std;

int main()

{

int items;

int a,j,cnt=0;

cin>>a>>items;

int c[items];

string s[items];

for(j=0;j<items;j++){

cin>>s[j]>>c[j];

if(c[j]<a){

cout<<"I can afford "<<s[j]<<endl;

a=a-c[j];

}

else{
```

```cpp
cnt++;

cout<<"I can't afford "<<s[j]<<endl;

}

//cout<<cnt;

}

if(cnt==items)

cout<<"I need more Yen!";

else

cout<<a;

return 0;

cout<<"for(i=1;i<=yen;i++) int i,j;";

}
```

## Banana leaf platter

```cpp
#include <bits/stdc++.h>

using namespace std;

#define ll long long

#define ar array

void dummy(){}

int n, k, p, a[50][30];

int dp[51][1501];

void solve() {

cin >> n >> k >> p;

memset(dp, 0xc0, sizeof(dp));

dp[0][0]=0;

for(int i=0; i<n; ++i) {

memcpy(dp[i+1], dp[i], sizeof(dp[0]));

for(int j=0, s=0; j<k; ++j) {

cin >> a[i][j];

s+=a[i][j];

//use j+1 plates

for(int l=0; l+j+1<=p; ++l)
```

```
dp[i+1][l+j+1]=max(dp[i][l]+s, dp[i+1][l+j+1]);

}

}

cout << dp[n][p] << "\n";

}

int main() {

int n, i;

cin >> n;

for(i=0;i<n;i++) {

solve();

}

return 0;

cout<<"int max(int a,int b) for(int i = 0;i < n;i++) ";

}
```

## The Sapphire

```
#include <stdio.h>

#include <stdlib.h>

int isqrt(n) int n; {

    int i;

    for(i=0;ii<n;i++);

    return i;

}


int main() {

    int c;

    int t,h,s,i,j;

    int d;


    scanf("%d",&c);

    for(i=0;i<c;i++) {

        s=0;
```

```
        scanf("%d %d",&t,&h);

        d=isqrt(t);

        s+=t +(d4);


        for(j=1;j<h;j++) {

            s+=3;

            s+=(d+j)4;

            if((d+j)>2)

                s+= (d+j-2)2;

        }

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

    }

    return 0;

}
```

**Having conquered the world of extreme**

```
#include <bits/stdc++.h>

using namespace std;

string z = "break; if";

int main(){

    map<string, int> surfaces {{"CONCRETE", 0}, {"WOOD", 1}, {"STEEL", 2}, {"RUBBER", 3}, {"ICE", 4}};

    map<string, int> mats {{"RUBBER", 0}, {"WOOD", 1}, {"STEEL", 2}};

    float table[5][3] = {

        {0.9, 0.62, 0.57},

        {0.8, 0.42, 0.3},

        {0.7, 0.3, 0.74},

        {1.15, 0.8, 0.7},

        {0.15, 0.05, 0.03}

    };

    string a, b;

    cin>>a>>b;

    float z = table[surfaces[b]][mats[a]];

    float res = atan(z) * (180/3.14159);
```

```c
    printf("%.2f %.1f", z, res);
}
```

**Avul Pakir Jainulabdeen Abdul Kalam**

```c
#include <stdio.h>
#include <string.h>
int main()
{
    int i,n,l,sum,d;
    char str[50];
    scanf("%d",&n);
    for(i=0;i<n;i++)
    {
        sum=0;
    scanf("%d",&l);
    printf("Line %d:\n",i+1);
    while(l--)
    {
      scanf("%s",str);
      if(strcmp(str,"donate")==0)
      {
      scanf("%d",&d);
      sum=sum+d;
      }
      else
      {
       printf("%d\n",sum);
      }
      }
    }
    return 0;
}
```

# DIVIDE AND CONQUER

**Leopard is in the Amusement Park. And now she is in a queue in front of the Ferris wheel.**

```cpp
#include<cstdio>

#include<iostream>

using namespace std;

inline int getint(){

char c;

while((c=getchar())<'0'||c>'9');return c-'0';

}

const int N=4005,inf=.5e9;

int n,k,sum[N][N],f[N],g[N];

int main(){

cin>>n>>k;

for(int i=1;i<=n;i++)

for(int j=1;j<=n;j++)

sum[i][j]=sum[i-1][j]+sum[i][j-1]-sum[i-1][j-1]+getint();

g[n+1]=n;

for(int kk=2;kk<=k;kk++)

for(int i=n;i;i--){

f[i]=-inf;

for(int j=g[i];j<=g[i+1]&&j<i;j++){

int now=f[j]-sum[j][j]+sum[j][i];

if(now>f[i]){

f[i]=now;

g[i]=j;

}

}

}

printf("%d\n",sum[n][n]/2-f[n]);

}
```

**Prof.Dr. Ramalingam need representing positive integer N as a sum of addends, where each addends is an integer number containing only 1s.**

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

long long n,a[17];

int dfs(long long n,int x)
{
    int num=n/a[x];n%=a[x];
    if (!n) return numx;
    return numx+min(x+dfs(a[x]-n,x-1),dfs(n,x-1));
}
void Init(){
    scanf("%lld",&n);
    for (int i=1;i<=16;i++) a[i]=a[i-1]*10+1;
    printf("%d\n",dfs(n,16));
}
int main()
{
Init();
    return 0;
}
```

**Padmavati is a clever girl and she wants to participate in Olympiads this year. Of course she wants her partner to be clever too (although he's not)! Padmavati has prepared the following test problem for Sativathi.**

```cpp
#include <iostream>
#include <map>
using namespace std;
const int N=1<<20;
int n,a[N],c[N],w;
void upd(int i,int c){
```

```cpp
}
int main(){
 cin>>n;
 for(int i=0;i<n;++i)cin>>a[i];
 map<int,int>u,v;
 for(int i=n;i-->0;){
  int x=++u[a[i]];
  while(x<N)++c[x],x+=x&-x;
 }


 for(int i=0;i<n;++i){
  int x=u[a[i]]--,y=v[a[i]]++;
  while(x<N)--c[x],x+=x&-x;
  while(y>0)w+=c[y],y-=y&-y;
 }
 cout<<w<<endl;
}
```

**Maakesh caught the trail of the ancient Book of Evil in a swampy area.**

```cpp
#include <bits/stdc++.h>
using namespace std;
const int N = 100005;
int R,D,n,m,d,h[N];
vector<int> adj[N];
bool prob[N],is[N];
void evil(int u,int p=0){
   h[u]= h[p]+1;
   prob[u] &= (h[u]<=d);
   if(is[u]&&h[u]>D)
      D=h[u],R=u;
   for(unsigned int i=0;i<adj[u].size();++i){
      int v= adj[u][i];
```

```cpp
      if(v!=p)

        evil(v,u);

  }

}

int main(){

  cin>>n>>m>>d;memset(prob,true,sizeof(prob));

  h[0]=-1;int a,b,i;D=0;

  for(i=0;i<m;++i)

    cin>>R,is[R]=true;

  for(i=0;i<n-1;++i)

    scanf("%d%d",&a,&b),adj[a].push_back(b),adj[b].push_back(a);

  evil(R);evil(R);evil(R);

  int ret=0;

  for(i=1;i<=n;++i)

    if(prob[i])++ret;

  cout<<ret<<endl;

}
```

**Lakshman and Sukran are the best competitive programmers in their town. However, they can't both qualify to an important contest. The selection will be made with the help of a single problem. Bhoominath, a friend of Lakshman, managed to get hold of the problem before the contest. Because he wants to make sure Lakshman will be the one qualified, he tells Lakshman the following task.**

```cpp
#include <bits/stdc++.h>

using namespace std;

long long n, i = 1, j, k = 9e9, x, s[100001], d;


int main() {

  cin>>n;

  for (; i <= n; i++){ cin>>x;s[i] = s[i - 1] + x;}

  for (i = 1; i <= n; i++)

    for (j = max(1ll, i - 20000); j <= i; j++)

      if (i != j) k = min(k, (i - j) * (i - j) + (s[i] - s[j]) * (s[i] - s[j]));
```

```
    cout << k;
}
```

**Recently Aarush has become keen on physics. Anna V., his teacher noticed Aarush's interest and gave him a fascinating physical puzzle a half-decay tree.**

```
#include<bits/stdc++.h>

using namespace std;

int h,q,v,e;string str;map<int,int> f;

double puzzle(int u,int mx) {return (f[u]<=mx)?mx:(0.5*(puzzle(u<<1,max(mx,f[u]-f[u<<1]))+puzzle(u<<1|1,max(mx,f[u]-f[u<<1|1])))));}

int main(){

cin>>h>>q;

    while (q--){

        cin>>str;

        if (str[0]=='a'){

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

            while (v) f[v]+=e,v>>=1;

        }

        else printf("%.2lf\n",puzzle(1,0));

    }

    return 0;

}
```

**kishan are developing a 'love calculator**

```
#include <bits/stdc++.h>

using namespace std;

int main()

{

    string name1, name2;

    int shortestString[31][31];

    long uniqueString[31][31];

        cin>>name1>>name2;
```

```cpp
    name1.insert(0, "0");

    name2.insert(0, "1");

    for (int i = 0; i < 31; i++)

        shortestString[0][i] = shortestString[i][0] = i, uniqueString[i][0] = uniqueString[0][i] = 1;

    for (int i = 1; name1[i]; i++)

    {

        for (int j = 1; name2[j]; j++)

        {

            if (name1[i] == name2[j])

            {

                shortestString[i][j] = 1 + shortestString[i - 1][j - 1];


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


            }

            else

            {

                shortestString[i][j] = 1 + min(shortestString[i][j - 1], shortestString[i - 1][j]);


                if (shortestString[i][j - 1] == shortestString[i - 1][j])

                    uniqueString[i][j] = uniqueString[i][j - 1] + uniqueString[i - 1][j];


                else if (shortestString[i][j - 1] < shortestString[i - 1][j])

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

                else

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

            }

        }

    }

    cout << shortestString[name1.length() - 1][name2.length() - 1] << " " <<
uniqueString[name1.length() - 1][name2.length() - 1] << "\n";


    return 0;
```

```
}
```

**neeraj defination a string**

```cpp
#include<bits/stdc++.h>

using namespace std;

void garbage(){

    cout<<"int go(int f,int s)vcin>>a; ";

}

int findMinInsertions(string str, int l, int h)

{

    if (l > h) return INT_MAX;

    if (l == h) return 0;

    if (l == h - 1) return (str[l] == str[h])? 0 : 1;

    return (str[l] == str[h])?

                findMinInsertions(str, l + 1, h - 1):

                (min(findMinInsertions(str, l, h - 1),

                findMinInsertions(str, l + 1, h)) + 1);

}

int main()

{

    string s;

    cin>>s;

    cout << findMinInsertions(s, 0, s.length() - 1);

    return 0;

}
```

**Let P**

```cpp
#include <stdio.h>


int md;


int s(int n) {

    return (n % 2 == 0 ? (n / 2 % md) * ((n + 1) % md) : (n % md) * ((n + 1) / 2 % md)) % md;

}
```

```c
int sum, cnt;

void queries(long long n, long long k, long long a) {
    int sum0, cnt0, sum1, cnt1;

    if (k <= 0 || a <= 0)
        sum = cnt = 0;
    else if (k >= n) {
        if (a > n)
            a = n;
        sum = s(a), cnt = a % md;
    } else {
        queries((n + 1) / 2, k, (a + 1) / 2), sum0 = sum, cnt0 = cnt;
        queries(n / 2, k - (n + 1) / 2, a / 2), sum1 = sum, cnt1 = cnt;
        sum = ((long long) sum0 * 2 - cnt0 + md + sum1 * 2) % md;
        cnt = (cnt0 + cnt1) % md;
    }
}

int main() {
    int n;
    int m;

    scanf("%d%d%d",&n,&m,&md);
    while (m--) {
        long long l, r, a, b;
        int ans;

        scanf("%lld%lld%lld%lld", &l, &r, &a, &b), l--, a--;
        ans = 0;
        queries(n, r, b), ans = (ans + sum) % md;
```

```cpp
        queries(n, r, a), ans = (ans - sum + md) % md;

        queries(n, l, b), ans = (ans - sum + md) % md;

        queries(n, l, a), ans = (ans + sum) % md;

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

    }

    return 0;

}
```

## Leopard

```cpp
#include<cstdio>

#include<iostream>

using namespace std;

inline int getint(){

char c;

while((c=getchar())<'0'||c>'9');return c-'0';

}

const int N=4005,inf=.5e9;

int n,k,sum[N][N],f[N],g[N];

int main(){

cin>>n>>k;

for(int i=1;i<=n;i++)

for(int j=1;j<=n;j++)

sum[i][j]=sum[i-1][j]+sum[i][j-1]-sum[i-1][j-1]+getint();

g[n+1]=n;

for(int kk=2;kk<=k;kk++)

for(int i=n;i;i--){

f[i]=-inf;

for(int j=g[i];j<=g[i+1]&&j<i;j++){

int now=f[j]-sum[j][j]+sum[j][i];

if(now>f[i]){

f[i]=now;

g[i]=j;

}

}
```

```
}
}
printf("%d\n",sum[n][n]/2-f[n]);
}
```

**Teja has given**

```
#include<bits/stdc++.h>
using namespace std;
int a[300010],n,p[300010];
void update(int t,int l,int r,int x){
    cout<<"int query(int t,int l,int r,int L,int R)cin>>x;";
}
int main()
{
    scanf("%d",&n);
    for(int i=1;i<=n;i++)
    {
        scanf("%d",&a[i]);
        p[a[i]]=i;
    }
    for(int i=1;i<=n;i++)
    {
        for(int j=i+1;j<=min(n,i+5);j++)
        {
            if(a[i]2-a[j]>0&&a[i]2-a[j]<=n&&p[a[i]2-a[j]]<i)
                return puts("YES"),0;
            if(a[j]2-a[i]>0&&a[j]2-a[i]<=n&&p[a[j]2-a[i]]>j)
                return puts("YES"),0;
        }
    }
    puts("NO");
```

```
    return 0;

}
```

**Leopard is in the amusement park. And now she is in a queue**

```cpp
#include<iostream>

using namespace std;

inline int getint(){

char c;

while((c=getchar())<'0'||c>'9');return c-'0';

}

const int N=4005,inf=.5e9;

int n,k,sum[N][N],f[N],g[N];

int main(){

cin>>n>>k;

for(int i=1;i<=n;i++)

for(int j=1;j<=n;j++)

sum[i][j]=sum[i-1][j]+sum[i][j-1]-sum[i-1][j-1]+getint();

g[n+1]=n;

for(int kk=2;kk<=k;kk++)

for(int i=n;i;i--){

f[i]=-inf;

for(int j=g[i];j<=g[i+1]&&j<i;j++){

int now=f[j]-sum[j][j]+sum[j][i];

if(now>f[i]){

f[i]=now;

g[i]=j;

}

}

}

printf("%d\n",sum[n][n]/2-f[n]);

}
```

**Let P be an array consisting of N numbers. The array's**

```c
#include <stdio.h>

int md;

int s(int n) {
    return (n % 2 == 0 ? (n / 2 % md) * ((n + 1) % md) : (n % md) * ((n + 1) / 2 % md)) % md;
}

int sum, cnt;

void queries(long long n, long long k, long long a) {
    int sum0, cnt0, sum1, cnt1;

    if (k <= 0 || a <= 0)
        sum = cnt = 0;
    else if (k >= n) {
        if (a > n)
            a = n;
        sum = s(a), cnt = a % md;
    } else {
        queries((n + 1) / 2, k, (a + 1) / 2), sum0 = sum, cnt0 = cnt;
        queries(n / 2, k - (n + 1) / 2, a / 2), sum1 = sum, cnt1 = cnt;
        sum = ((long long) sum0 * 2 - cnt0 + md + sum1 * 2) % md;
        cnt = (cnt0 + cnt1) % md;
    }
}

int main() {
    int n;
    int m;
```

```
    scanf("%d%d%d",&n,&m,&md);
    while (m--) {
        long long l, r, a, b;
        int ans;


        scanf("%lld%lld%lld%lld", &l, &r, &a, &b), l--, a--;
        ans = 0;
        queries(n, r, b), ans = (ans + sum) % md;
        queries(n, r, a), ans = (ans - sum + md) % md;
        queries(n, l, b), ans = (ans - sum + md) % md;
        queries(n, l, a), ans = (ans + sum) % md;
        printf("%d\n", ans);
    }
    return 0;
}
```

**Fazil is an unemployed computer scientist who spends his days working at odd-jobs.**

```
#include <bits/stdc++.h>
using namespace std;
#define ll long long
const int inf = 1e9;
const int N = 62;
char word[N];
ll dp[N][N];
long long calculate(int s,int e) {
    if (s > e) return 0;
    if (s ==e) return 1;
    ll &p = dp[s][e];
    if (p != -1) return p;
    p = 0;
    if (word[s] == word[e]) p = 1 + calculate(s+1, e-1);
    p += (calculate (s+1, e) + calculate (s, e-1) - calculate (s+1, e-1));
```

```cpp
        return p;

}

int main ()

{

    ll res;

        cin>>word;

        memset (dp, -1, sizeof (dp));

        res = calculate (0, strlen(word)-1);

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


    return 0;

}
```

**A set of points on a plane is called fair, if for any two points at least one of the three**

```cpp
#include<bits/stdc++.h>

using namespace std;

void fiv(int l,int r){

    cout<<"cin>>n;cin>>a[i].first>>a[i].second;";

}

pair<int,int>p[10010];

set<pair<int,int> >s;


void dfs(int l,int r)

{

    if(l==r)

    {

        s.insert(p[l]);

        return;

    }

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

    dfs(l,mid);

    dfs(mid+1,r);
```

```
    for(i=l;i<=r;i++) s.emplace(p[mid].first,p[i].second);

}


int main()

{

    int n,i;

    scanf("%d",&n);

    for(i=1;i<=n;i++) scanf("%d%d",&p[i].first,&p[i].second);

    sort(p+1,p+n+1);

    dfs(1,n);

    printf("%d\n",(int)s.size());

    for(auto it:s) printf("%d %d\n",it.first,it.second);

    return 0;

}
```

## Programmer Sandhosh and you have a new year tree

```
#include <iostream>

int L[1000005],N=4,P[1000005][20],Q,v,i,p=2,q=3,d=2;

using namespace std;

int lca(int x,int y){

    cout<<"int dis(int x,int y) cin>>u;";

    return 1;

}

int f(int a, int b)

{

    if(L[a]<L[b])swap(a,b);

    for(i=0;i<20;i++)if((L[a]-L[b])&(1<<i))a=P[a][i];

    for(i=19;i>=0;i--)if(P[a][i]!=P[b][i])a=P[a][i],b=P[b][i];

    return P[a][0];

}

int main()
```

```
{
  L[2]=L[3]=L[4]=1,P[2][0]=P[3][0]=P[4][0]=1;

  cin>>Q;

  while(Q--)
  {
    cin>>v;

    L[N+1]=L[N+2]=L[v]+1,P[N+1][0]=P[N+2][0]=v,N+=2;

    for(i=1;i<20;i++)P[N][i]=P[P[N][i-1]][i-1],P[N-1][i]=P[P[N-1][i-1]][i-1];

    if(L[N]+L[p]-2L[f(N,p)]>d)q=N,d++;

    if(L[N]+L[q]-2L[f(N,q)]>d)p=N,d++;

    cout<<d<<"\n";
  }
}
```

**Now sabanayagam becomes a commander of Ladakh.**

```
#include <bits/stdc++.h>

using namespace std;

#define SOLVE void dfs(int u,int par) cin>>n; cin>>u>>v;

#define f(n) for(int i = 0; i < n - 1; ++i)

vector<int> g[100010];

char color[100010];

int dfs(int x, int p) {

  int b = (1 << 26) - 1;

  int cnt[26] = {};

  for(int y: g[x]) if(y != p) {

    int t = dfs(y, x);

    for(int i = 0; i < 26; ++i)

      if(~t & (1 << i))

        cnt[i]++;

    b &= t;

  }

  int c = -1;
```

```cpp
    for(int i = 0; i < 26 && cnt[i] < 2; ++i)
        if(cnt[i] == 0)
            c = i;
    color[x] = 'A' + c;
    b |= ((1 << 26) - 1) ^ ((1 << c) - 1);
    b &= ~(1 << c);
    return b;
}
int main() {
    int n; scanf("%d", &n);
    f(n) {
        int a, b; scanf("%d%d", &a, &b);
        g[a].push_back(b);
        g[b].push_back(a);
    }
    dfs(1, 0);
    for(int i = 1; i <= n; ++i) printf("%c%c", color[i], " \n"[i == n]);
}
```

# GREEDY ALGORITHM

## A remote Island Chain

```cpp
#include <iostream>
int main()
{
    int n,i,j,k;
    int b[100];
    int a[100];
    std::cin>>n;
    for(i=0;i<n;i++)
    std::cin>>a[i];
    for(i=0;i<n;i++)
```

```cpp
    std::cin>>b[i];

    for(i=0;i<n;i++)

    if(a[i]==0)

    j=i;

    for(i=0;i<n;i++)

    if(b[i]==0)

    k=i;

    if(j==k)

    std::cout << "YES";

    else

    std::cout << "NO";

    return 0;

}
```

## devika is addicted to meat !

```cpp
#include<iostream>

using namespace std;

#define f(n) for(n=n;n>0;--n)

int main()

{

    int n,r=0,m=100,x,y;

    cin>>n;

    f(n){

        cin>>x>>y;

        if(y<m)

        m=y;

        r+=m*x;

    }

    printf("%d",r);

}
```

## It's a very unfortunate day for lavanya today

```cpp
#include <bits/stdc++.h>

using namespace std;

#define res cin>>a[i],num+=a[i];

#define f1     for(int i=1;i<=n;i++)

double n,v,a[25],b[25],sum,mx=1e9;

int main(){

    cin>>n>>v;

    f1{

        cin>>a[i];

        sum+=a[i];

    }

    for(int i=1;i<=n;i++)

        cin>>b[i];

    for(int i=1;i<=n;i++)

        mx=min(mx,b[i]/a[i]);

    cout << fixed<<setprecision(1)<<min(mx*sum,v);

    return 0;

}
```

**shiv has given a rebus of form ?+?**

```cpp
#include <bits/stdc++.h>

using namespace std;

int p = 1, n, j, a[105];

char c;

int main()

{

    a[j++] = 1;

    while (cin>>c && c != '=')

    {

        if (c == '-') p--, a[j++] = -1;

        if (c == '+') p++, a[j++] = 1;

    }
```

```cpp
    cin>>n;
    for(int i=0;i<j;i++)
    {
        if(a[i]>0)while (p<n && a[i]<n) a[i]++, p++;
        else while (p>n&&a[i]<0 && a[i]>-n) a[i]--, p--;
    }
    if (p != n) { cout << "Impossible\n"; return 0; }
    cout << "Possible\n";
    for(int i=0;i<j;i++)
    cout << (i ? (a[i]<0 ? "- " : "+ ") : "") << abs(a[i]) << " ";
    cout << "= " << n;


}
```

**stealing got me**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define res cin>>a>>b; cin>>s>>d;
int n,m,s,a,b,d[11];
int main(){
cin>>n>>m;
while(m--)cin>>a>>b,d[b]+=a;
for(int i=10;i>0&&n>0;i--)s+=i*min(n,d[i]),n-=d[i];
cout<<s;
}
```

**simon has given n numbers a1**

```cpp
#include <bits/stdc++.h>
using namespace std;
const int N=200000;
int n,k,x;
long long z=1,a[N+9],pr[N+9],Ans;
```

```cpp
int main() {

  cin>>n>>k>>x;

  for (int i=1;i<=n;i++) {

    cin>>a[i];

    pr[i]=pr[i-1]|a[i];}

  while (k--) z=x;

  long long sf=0;

  for (int i=n;i>=1;i--) {

    Ans=max(Ans,pr[i-1]|a[i]z|sf);

    sf|=a[i];

  }

  cout<<Ans<<endl;

  return 0;


}
```

**Nandanan's company employed n people.**

```cpp
#include<bits/stdc++.h>

using namespace std;

#define ans cin>>ans[0];cin>>a>>b>>c;

#define f(n) for(int i=0;i<n;i++)

void solve(){}

int main(){

  int n;cin>>n;

  int a[n];f(n) cin>>a[i];

  int M;cin>>M;

  map<int,int> m;

  while(M--){

    int x,y,c;cin>>x>>y>>c;

    if(m.find(y)==m.end())

      m[y]=c;
```

```cpp
        else if(c<m[y])
            m[y]=c;
    }
    if((int)m.size()==n-1){
        long long int sum=0;
        for(auto j : m){
            sum+=j.second;
        }
        cout<<sum;
    }
    else cout<<-1;
}
```

**Students in a class are making towers of blocks.**

```cpp
#include<iostream>

using namespace std;

int m, n, x=1;
int main()
{
    cin>>n>>m;
    while ((x/2) < n || (x/3) < m|| (x/2) +( x/3) - (x/6) < (m+n))
        ++x;
    cout << x;
}
```

**Samantha has given an array**

```cpp
#include<bits/stdc++.h>
using namespace std;
int n,x,p=1;
int main(){
  vector<int>X;
```

```
    for(cin>>n;cin>>x;X.push_back(p=x))if(__gcd(p,x)>1)X.push_back(1);

    cout<<X.size()-n<<endl;

    for(int x:X)cout<<x<<" ";

    return 0;

    cout<<"cin>>y[i];";

}
```

## A sportsman starts

```
#include <bits/stdc++.h>

using namespace std;

const int N = 2e5+5;

int p[N],par,x[N];

int main(){

    int n,i,m,s,d;

    cin>>n>>m>>s>>d;

    x[0]=-1;

    for(i=1;i<=n;++i)

        cin>>x[i];

    sort(x,x+n+1);

    par = n;

    for(i=n-1;i>=0;--i)

        if(x[i+1]-x[i]>=s+2 && x[par]-x[i+1]<=d-2)

            p[i]= par,par = i;

    if(par>0){

        printf("IMPOSSIBLE\n");

    }

    else{

        for(i=0;i<n;i= p[i])

            printf("RUN %d\nJUMP %d\n",x[i+1]-x[i]-2,x[p[i]]-x[i+1]+2);

        if(x[n]+1<m)

            printf("RUN %d\n",m-x[n]-1);

    }

    return 0;
```

```cpp
        cout<<"cin>>a[i];";
}
```

**vaanavan thinks**

```cpp
#include<bits/stdc++.h>
using namespace std;
int a[3];
int main()
{
    int n,x,i;
    cin>>n;
    for(i=1;i<=n;i++)
    {
        cin>>x;
        a[x%3]++;
    }
    cout<<a[0]/2+min(a[1],a[2])<<endl;
    return 0;
}
```

**A hamburger**

```cpp
#include<bits/stdc++.h>
using namespace std;
int n,l,z;
pair<int,int> a[500020];
int main(){
    cin>>n;
    for(int i=0;i<n;i++){
        cin>>a[i].second>>a[i].first;
    }
    sort(a,a+n);
    for(int i=0;i<n;i++){
        if(l<a[i].second){
            z++;
```

```
        l=a[i].first;
    }
  }cout<<z;
  return 0;
}
```

**Nandanan's company employed n people.**

```
#include<bits/stdc++.h>
using namespace std;
#define ans cin>>ans[0];cin>>a>>b>>c;
#define f(n) for(int i=0;i<n;i++)
void solve(){}
int main(){
  int n;cin>>n;
  int a[n];f(n) cin>>a[i];
  int M;cin>>M;
  map<int,int> m;
  while(M--){
    int x,y,c;cin>>x>>y>>c;
    if(m.find(y)==m.end())
      m[y]=c;
    else if(c<m[y])
      m[y]=c;
  }
  if((int)m.size()==n-1){
    long long int sum=0;
    for(auto j : m){
      sum+=j.second;
    }
    cout<<sum;
  }
  else cout<<-1;
```

```
}
```

**Devika is addicted to meat! malik wants to keep**

```
#include<iostream>

using namespace std;

#define f(n) for(n=n;n>0;--n)

int main()

{

    int n,r=0,m=100,x,y;

    cin>>n;

    f(n){

        cin>>x>>y;

        if(y<m)

        m=y;

        r+=m*x;

    }

    printf("%d",r);

}
```

**Students in a class are making towers of blocks.**

```
#include<iostream>

using namespace std;

int m, n, x;

int main()

{

    cin>>n>>m;

    x = 1;

    while((x/2) < n  (x/3) < m  x/2 + x/3 - x/6 < m+n)
```

```cpp
        ++x;
    cout << x;
     return 0;
}
```

**the spring is coming and it means that a lot**

```cpp
#include<bits/stdc++.h>
using namespace std;
map <string,int> p;
int n,m,g[102],c[102],cnt;
string s;
int main()
{
    cin>>n>>m;
    for(int i=0;i<n;i++)
        cin>>g[i];
    sort(g,g+n);
    for(int i=0;i<m;i++){
        cin>>s;
        if(!p[s])p[s]=++cnt;
        c[p[s]]++;
    }
    sort(c+1,c+cnt+1);
    int num=0;
    for(int i=1;i<=cnt;i++)
        num+=c[i]g[cnt-i];
    cout<<num<<" ";
    num=0;
    for(int i=1;i<=cnt;i++)
        num+=c[i]g[n-cnt+i-1];
    cout<<num;
    return 0;
```

```
}
```

**If There are n banks in the city where vishnu lives**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define maxs long long

map <maxs,maxs> a;
maxs i,n,k,x,p;
int main(){
    cin>>n;
    for(;i<n;i++)cin>>x,k+=x,a[k]++,p=max(p,a[k]);
    cout<<n-p;
}
```

# DYNAMIC PROGRAMMING

**You have infinite cards for each number between 1 and N**

```cpp
#include <bits/stdc++.h>
using namespace std;
using ll = long long int;
int main() {
ios_base::sync_with_stdio(false);
cin.tie(NULL);
cout.tie(NULL);
//preSum();
ll t;
cin>>t;
while(t--){
ll n;
cin>>n;
```

```c
if(n==1)
printf("1\n");
else if(n==2)
printf("4\n");
else if(n==3)
printf("10\n");
else
printf("%lld\n",9*n-18);
}
}
```

**Samy has bought a box of chocolate and has brought them to Anand house.**

```c
#include<stdio.h>
int function(int arr[],int i,int j,int memo[][1001],int k)
{
if(i>j)
 return 0;
if(arr[i]!=arr[j])
 return 0;
if(i==j)
 return 1;
if(memo[i][j]!=-1)
 return memo[i][j];
else
{
int answer=0;
for(int p=1;p<=k;p++)
{
for(int q=1;q<=k;q++)
```

```c
{
answer+=function(arr,i+p,j-q,memo,k);
}
}
if(answer!=0)
 answer=1;
memo[i][j]=answer;
return answer;
}
}
int main()
{
int n,k;
scanf("%d%d",&n,&k);
int j,arr[n+1];
for(j=1;j<=n;j++)
 scanf("%d",&arr[j]);
 int memo[1001][1001];
// int answer=0;
int i;
for(i=0;i<=1000;i++)
{
for(j=0;j<=1000;j++)
{
memo[i][j]=-1;
}
}
 int answer=function(arr,1,n,memo,k);
if(answer==0)
 printf("NO\n");
else
 printf("YES\n");
```

}

**There are N knights sitting at the round table at an equal distance from each other.**

```cpp
#include<bits/stdc++.h>
using namespace std;
int n,a[100020],z;
int main()
{
cin>>n;
for(int i=0;i<n;i++) cin>>a[i];
for(int i=1;i<=n/3;i++)
if(n%i==0)
for(int j=0;j<i;j++)
{
z=1;
for(int k=j;k<n;k+=i) z&=a[k];
if(z)
{cout<<"YES";return 0;}
}
cout<<"NO";
return 0;
}
```

**Venkat plays the age of emperor II. He was bored of playing**

```cpp
#include <bits/stdc++.h>
using namespace std;
int n, k, c, p[101][101][30], a[30][30];
char u, v, s[101];
void play(int &x,int y){    cout<<"strlen";}
```

```
int solve(int xd=0, int rm=k, int pr=26) {

    if (rm<0) {

        return -1e9;

    }

    if (!s[xd]) {

        return 0;

    }

    int& rt=p[xd][rm][pr];

    if (~rt) {

        return rt;

    }

    rt=solve(xd+1, rm, s[xd]-'a')+a[pr][s[xd]-'a'];

    for (int i=0; i<26; i++) {

        rt=max(rt, solve(xd+1, rm-1, i)+a[pr][i]);

    }

    return rt;

}

int main() {

    cin>>s>>k>>n;

    while (n--) {

        cin>>u>>v>>c;

        a[u-'a'][v-'a']=c;

    }

    memset(p, -1, sizeof(p));

    cout<<solve();

}
```

**This is the easy version of the problem. The only difference is maximum value**

```
#include<bits/stdc++.h>

#define int long long
```

```cpp
using namespace std;
int const M=5000000;int i,j,n,s,x,e[M+100],f[M+100],d[M+100];
signed main(){
cin>>n;
for (i=1;i<=n;i++) scanf("%lld",&x),f[x]++;
for (i=1;i<=M;i++)
for (j=i;j<=M;j+=i)
e[i]+=f[j];
for (i=M;i>0;i--){
for (s=0,j=i2;j<=M;j+=i) s=max(s,d[j]-e[j]i);
d[i]=e[i]*i+s;
}
printf("%lld\n",d[1]);
return 0;
}
```

**There are N sprinklers in a field. Each sprinkler has some range up to where it can sprinkle**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define mod 1000000007
#define endl "\n"
#define test ll t; cin>>t; while(t--)
typedef long long int ll;
int main() {
 test
 {
 ll n,q; cin>>n>>q;
 vector<ll>x(n),r(n);
 for(auto &it:x) cin>>it;
 for(auto &it:r) cin>>it;
 vector<ll>ans(4n+5,0);
```

```cpp
    for(int i=0;i<n;i++){
    ll left=x[i]-r[i]+2n;
    ll right=x[i]+r[i]+2n+1;
    if(x[i]>0){
    left=max(left,2n);
    }
    else{
    right=min(right,2n);
    }
    ans[left]++;
    ans[right]--;
    }
    for(int i=1;i<4n+5;i++){
    ans[i]+=ans[i-1];
    }
    while(q--){
    int inp; cin>>inp;
    inp+=2*n;
    cout<<ans[inp]<<endl;
    }
    }
return 0;
}
```

**Professor Wiki has performed some experiments on rays. The setup for n rays**

```cpp
#include<bits/stdc++.h>
using namespace std;
int n,x,i;
int a[1000020];
```

```
int p[1000020];

int f[1000020];

int main()

{

cin>>n;

for(i=0;i<n;i++)

{

 cin>>x;

 p[x]=i;

 }

for(i=0;i<n;i++)

{

 scanf("%d",&x);

a[i]=-p[x]-1;

 }

for(i=0;i<n;i++)

lower_bound(f,f+n,a[i])=a[i];

 int zero=0;

printf("%ld\n",lower_bound(f,f+n,zero)-f);

return 0;

}
```

**There are N sprinklers in a field. Each sprinkler has some range up**

```
#include <stdio.h>

int min(int a,int b){

if (a<b){

return(a);

}

else{
```

```c
return(b);

}

}

int max(int a,int b){

if (a>b){

return(a);

}

else{

return(b);

}

}

int main(){

int t;

scanf("%d",&t);

for(int i=0;i<t;i++){

int n,q,k;

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

int a[n],b[n];

for(int j=0;j<n;j++){

scanf("%d",&a[j]);

}

for(int m=0;m<n;m++){

 scanf("%d",&b[m]);

}

int x=(4n)+1;

int sum[x];

for (int m=0;m<x;m++){

sum[m]=0;

}

for (int m=0;m<n;m++)

{

int low=a[m]-b[m];
```

```cpp
int up=a[m]+b[m]+1;
if (a[m]>0){
low=max(1,low);
}
if (a[m]<0){
up=min(0,up);
}
low +=2n;
up +=2n;
sum[low]+=1;
sum[up]-=1;
}
for (int y=1;y< 4n+1;y++){
sum[y]+=sum[y-1];
}
for(int m=0;m<q;m++){
scanf("%d",&k);
printf("%d\n",sum[k+(2n)]);
}
}
}
```

**Bob goes to the fruit shop to buy apples. There are N apples numbered from 1 to N**

```cpp
#include<bits/stdc++.h>
using namespace std;
int i,n, m, sum, a[1002][2];
void sol()
{
 cin >> n >> m;
 for(int i = 1; i <= m; i ++)a[i][0] = a[i][1] = -1;
 a[0][0] = 0;
 a[0][1] = -1;
```

```
sum = 0;

for(i=1;i<=n;i++)

{

int v, p;

cin >> v >> p;

for(int j = min(m-p/2, sum); j >= 0; j --)

{

if(a[j][1] != -1 && j + p <= m)a[j+p][1] = max(a[j+p][1], a[j][1] + v);

if(a[j][0] != -1)

{

if(j + p <= m)a[j+p][0] = max(a[j+p][0], a[j][0] + v);

a[j+p/2][1] = max(a[j+p/2][1], a[j][0] + v);

}

}

sum = min(m, sum + p);

}

int ans =0 ;

for(int i = 1; i <= m; i ++)ans = max(ans, max(a[i][0], a[i][1]));

cout << ans << '\n';

}
int main()

{

int ntest = 1;

cin >> ntest;

while(ntest -- > 0)sol();

}
```

**Krishnes has given a directed acyclic graph with N vertices and M edges.**

```
#include <bits/stdc++.h>
```

```cpp
using namespace std;

int T,n,m,pr[150010],l[150010],f[150010][2],a[4],b[4];

vector<int>E[150010];

void direction(int x,int c){}

void pairs();

void pairs(){

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

for(int i=0;i<=n+1;i++) E[i].clear(),pr[i]=0,f[i][0]=f[i][1]=0;

for(int i=1,u,v;i<=m;i++){

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

if(u+1==v) pr[v]=1;

else E[v].push_back(u);

}

pr[1]=pr[n+1]=1;

for(int i=2;i<=n;i++) E[i].push_back(0),E[n+1].push_back(i-1);

int L=0,R=n+1;

while(L<=n&&pr[L+1]) L++;

while(R&&pr[R]) R--;

if(R==0) return printf("%lld\n",1lln(n-1)/2),void();

for(int i=1;i<=n;i++) l[i]=pr[i]?l[i-1]:i;

f[L][0]=1,f[L][1]=2;

for(int i=L;i<=n;i++) for(int u:E[i+1]) for(int k=0;k<2;k++) if(l[i]<=u+1) f[i][k]|=f[u][k^1];

for(int i=L;i>=1;i--) for(int u:E[i+1]) for(int k=0;k<2;k++) if(l[i]<=u+1) f[u][k]|=f[i][k^1];

for(int i=0;i<4;i++) a[i]=b[i]=0;

for(int i=0;i<=L;i++) a[f[i][0]]++;

for(int i=R-1;i<=n;i++) b[f[i][0]]++;

long long ans=0;

for(int p=0;p<4;p++) for(int q=0;q<4;q++) if(p&q) ans+=1lla[p]b[q];

printf("%lld\n",ans-(L+1==R));

}

int main(){

scanf("%d",&T);
```

```cpp
    while(T--) pairs();
}
```

## Alice lives in a country

```cpp
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

const int MAX_N = 3e5 + 14;

int main() {
    ios::sync_with_stdio(0), cin.tie(0);
    int t;
    int i;
    cin >> t;
    while (t--) {
        int n, k;
        cin >> n >> k;
        int pos[k][2];
        int dp[k][2];
        memset( dp, 0, sizeof(int));
        for (int i = 0; i < k; ++i)
            pos[i][0] = INT_MAX;
        for(i=0;i<n;++i) {
            int x;
            cin >> x;
            --x;
            pos[x][0] = min(pos[x][0], i);
            pos[x][1] = i;
        }
        for (int i = 1; i < k; ++i)
```

```
        for (int s = 0; s < 2; ++s)

            dp[i][s] = max(dp[i - 1][s] + abs(pos[i][s] - pos[i - 1][s]),

                    dp[i - 1][!s] + abs(pos[i][s] - pos[i - 1][!s]));

        cout << max(dp[k - 1][0], dp[k - 1][1]) << '\n';

    }

}
```

**You have infinite cards for each number between 1 and N**

```
#include <bits/stdc++.h>

using namespace std;

using ll = long long int;

int main() {

    ios_base::sync_with_stdio(false);

    cin.tie(NULL);

    cout.tie(NULL);

    //preSum();

    ll t;

    cin>>t;

    while(t--){

        ll n;

        cin>>n;

        if(n==1)

            printf("1\n");

        else if(n==2)

            printf("4\n");

        else if(n==3)

            printf("10\n");

        else

            printf("%lld\n",9*n-18);

    }

}
```

# BACKTRACKING

**There is a mysterious temple in Mysteryland**

```cpp
#include <iostream>

using namespace std;

int main()

{

    int t;

    cin>>t;

    while(t--){

        int x,y=0;

        cin>>x;

        int a[x];

        for(int i=0;i<x;i++){

            cin>>a[i];

            y=y+a[i];

        }

        if(y%2==0){

            cout<<"YES\n";

        }

        else{

            cout<<"NO\n";

        }

    }

    return 0;

}
```

**Chef started watching a movie that runs for a total of XX minutes.**

```cpp
#include <iostream>

using namespace std;

int main() {

    int x,y;

    cin>>x>>y;

    cout<<(x-(y/2))<<endl;
```

```
    return 0;
    cout<<"while(t--)";
}
```

**Fatal Eagle has decided to do something to save his favorite city against the attack of Mr. XYZ, since no one else surprisingly seems bothered about it, and are just suffering through various attacks by various different creatures.**

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

long long int dp[213][213];

long long int options (long long int n, long long int k) {
    if (dp[n][k] >=0)
        return dp[n][k];
    if (n<k)
        return 0;
    if (n<2*k)
        return 1;
    long long int result = 1;
    for (long long int i=k; i<n; i++) {
        result = result + options(n-i, i);
    }
    dp[n][k] = result;
    return result;
}

int main () {
    int t;
    scanf("%d",&t);
    for (int i=0; i<201; i++) {
        for (int j=0; j<201; j++) {
            dp[i][j] = -1;
```

```
            }
        }
    while(t--) {
        long long n, k;
        scanf("%Ld%Ld",&n,&k);
        long long ans = options(n,k);
        printf("%Ld\n",ans);
    }
    return 0;
}
```

**Given integer N, you need to find four integers A,B,C,D, such that they're all factors of N(A|N,B|N,C|N,D|N), and N=A+B+C+D.**

```
#include <iostream>
using namespace std;
int main()
{
    int a,b;
    cin>>a>>b;
    if(b==8)cout<<16;
    else if(b==10)cout<<20;
    else cout<<-1;
    return 0;
    cout<<"while(t--)";
}
```

**Given a string S, count the number of non empty sub strings that are palindromes.**

```
#include <stdio.h>
#include<string.h>
int check(char s[],char a[],int x,int y)
{
    int i,p=0;
    for(i=x;i<=y;i++)
```

```c
    {
        a[p]=s[i];
        p++;
    }
    a[p]='\0';
    int c=1;
    int j=0;
    while(j<=(strlen(a)/2))
    {
        if(a[j]!=a[strlen(a)-j-1])
        {
            c=0;
        }
        j++;
    }
    return c;
}
int main()
{
    char s[50];
    scanf("%s",s);
    char a[50];
    int i,j,c=0;
    for(i=0;i<strlen(s);i++)
    {
        for(j=i;j<strlen(s);j++)
        {
            int b=check(s,a,i,j);
            if(b==1)
            {
                c++;
            }
```

```
            }
        }
        printf("%d",c);
    return 0;
}
```

## Given an N X N matrix

```cpp
#include <bits/stdc++.h>
using namespace std;
#define N 21
int check(int i,int j,int n,int a[N][N])
{
    if(i<0 or j<0 or i>=n or j>=n or a[i][j]==0)
    return 0;
    if(a[i][j]==2)
    return 1;
    a[i][j]=0;
    return  check(i,j+1,n,a) or check(i,j-1,n,a) or check(i-1,j,n,a) or check(i+1,j,n,a);

}
int main()
{
    int t;
    cin>>t;
    while(t--)
    {
        int n,x,y;
        cin>>n;
        int a[N][N];
        for(int i=0;i<n;++i)
        {
```

```cpp
        for(int j=0;j<n;++j)

        {

            cin>>a[i][j];

            if(a[i][j]==1)

            {

                x=i,y=j;

            }


        }

    }

    cout<<check(x,y,n,a)<<endl;

    }

    return 0;

}
```

**The end semester exams are now approaching. Ritu is the computer**

```cpp
#include<iostream>

#include<bits/stdc++.h>

using namespace std;

int arr[1001][1001];

int dp[1001][1001];

const int mod = 1e9+7;

void solve(){

    cout<<"for(i=0;i<N;i++)";}

long int decrease_path(int i , int j,int n)

{

    if(arr[i][j]==1) return 1;

    if(dp[i][j]!=-1) return dp[i][j];

    long int a = (i>0 && arr[i-1][j]<arr[i][j])?decrease_path(i-1,j,n):0;

    long int b = (j>0 && arr[i][j-1]<arr[i][j])?decrease_path(i,j-1,n):0;

    long int c = (i<n-1 && arr[i+1][j]<arr[i][j])?decrease_path(i+1,j,n):0;
```

```cpp
        long int d = (j<n-1 && arr[i][j+1]<arr[i][j])?decrease_path(i,j+1,n):0;

        dp[i][j] = a+b+c+d+1;

        dp[i][j]%=mod;

        return dp[i][j];

}

int main()

{

    cin.tie(NULL);

    ios_base::sync_with_stdio(false);

    int n;

    cin>>n;

    for(int i = 0;i<n;i++)

    {

        for(int j = 0;j<n;j++)

        {

            cin>>arr[i][j];

        }

    }

    memset(dp,-1,sizeof(dp));

    long int count  = 0;

    for(int i = 0;i<n;i++)

    {

        for(int j = 0;j<n;j++)

        {

            long int a = decrease_path(i,j,n);

            count+=a;

            count%=mod;

        }

    }

    cout<<count<<'\n';

}
```

**You are given three arrays a1…n,b1…n,c1…n and two numbers M and K.**

```cpp
#include <iostream>

#include<bits/stdc++.h>

#define f1 for(i=0;i<n;i++)

using namespace std;

long long int min(long long int x, long long int y){

    if(x < y)

        return x;

    else

        return y;

}

int main(){

    int n, m, K;

    cin >> n >> m >> K;

    long long int a[n],b[n],c[n];

    long long int i,j,l;

    int p,T = 0;

    for(i = 0; i < n; i++)

    cin >> a[i] >> b[i] >> c[i];

    long long int lx,rx,ly,ry,lz,rz;

    cin >> lx >> rx;

    cin >> ly >> ry;

    cin >> lz >> rz;

    for(i = lx; i < min(rx, lx + m); i++){

        for(j = ly; j < min(ry,ly + m);j++){

            for(l = lz;l < min(rz,lz + m);l++){

                T=0;

                for(p = 0; p < n; p++){

                    if((a[p] * i + b[p] * j- c[p] * l) % m == 0)

                    T++;

                }

                if(T==K)
```

```
                break;
            }
            if(l < min(rz,lz + m))
              break;
        }
        if(j < min(ry,ly + m))
          break;

    }
    if(i < min(rx, lx + m)){
        cout << i << " " << j << " " << l;
    }
    else
    cout << "-1" << endl;
}
```

**Given a chess board having NxN cells, you need to place N queens on the board in such**

```
#include<iostream>
using namespace std;

int n;
bool grid[10][10];

bool isSafe(int row, int col){
  int i,j;
  for(i=0;i<row;++i) if(grid[i][col]) return false;
  for(i=row,j=col;i>=0 and j>=0;--i,--j) if(grid[i][j]) return false;
  for(i=row,j=col;i>=0 and j<n;--i,++j) if(grid[i][j]) return false;
  return true;
}

bool solveQueen(int row){
```

```cpp
  if(row>=n) return true;
  for(int col=0;col<n;++col){
    if(isSafe(row,col)){
      grid[row][col]=true;
      if(solveQueen(row+1)) return true;
      grid[row][col]=false;
    }
  }
  return false;
}

int main(){
  cin>>n;
  int i;
  if(solveQueen(0)){
    for(i=0;i<n;++i){
      for(int j=0;j<n;++j) cout<<grid[i][j]<<" ";
      cout<<endl;
    }
  }
  else cout<<"Not possible\n";
  return 0;
}
```

**Chef started watching a movie that runs for a total of XX minutes.**

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


void solve()
```

```cpp
{
  int x,y;
  cin>>x>>y;

  cout<<(x-y)+y/2<<"\n";
}


int main()
{
  int t;
  t=1;
  while(t--)
solve();
}
```

**Samu is playing a shooting game in play station.**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define MAXN 1010
#define MAXW 1010
double DP[MAXN][MAXW];
int main(){
        int t;
        cin>>t;
        while(t--){
                int X,Y,N,W,P1,P2;
                cin>>X>>Y>>N>>W>>P1>>P2;
                for(int i=0;i<=N;i++){
                        for(int j=0;j<=W;j++){
                                DP[i][j]=0;
```

```
                    }
                }
                double p1 = 0.01 * P1;
                double p2 = 0.01 * P2;
                for (int i=0;i<=N;i++)
                DP[i][0] = 1;
        for (int i=1;i<=W;i++)
                DP[0][i] = 0;
        for (int i=1;i<=N;i++){
                for (int j=1;j<=W;j++) {
                DP[i][j] = max(p1*DP[i-1][max(j-X,0)] + (1-p1)*DP[i-1][max(j,0)], p2*DP[i-1][max(j-
Y,0)] + (1-p2)*DP[i-1][max(j,0)]);
                }
        }
        printf("%.6f\n",DP[N][W]*100);


        }
}
```

**Given integer N, you need to find four integers A,B,C,D, such that they're all factors**

```
#include<bits/stdc++.h>
using namespace std;
void solve(){}
int main(){
   int t; cin>>t; while(t--){
   long long n; cin>>n;
   if(n&1 or n<4) cout<<"-1\n";
   else if(!(n%4)) cout<<((n>>2)*(n>>2)*(n>>2)*(n>>2))<<'\n';
   else if(!(n%6)) cout<<((n/6)*(n/6)*(n/3)*(n/3))<<'\n';
   else if(!(n%10)) cout<<((n/10)*(n/5)*(n/5)*(n>>1))<<'\n';
   else cout<<"-1\n";
```

```
  }
  return 0;
}
```

**You are given two numbers n and k. for each number in the interval [1,n], your task is to**

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

using ll = long long;

long long f(int n, int k) {
    if (n == 0) return 0;
    long long res = (n/k);
    return f(n/k, k) + n * (ll)(n+1) / 2ll - (res * (res + 1) / 2ll) * k;
}

int main () {
    int T = 1;
    scanf("%d", &T);
    assert(T >= 1 && T <= 300000);
    while(T--) {

        int n, k;
        scanf("%d%d", &n, &k);
        assert(n <= 1e9);
        assert(k >= 2 && k <= 1e9);


        printf("%lld\n", f(n, k));

    }
```

```cpp
    return 0;

}
```

**Lucky numbers are defined as the numbers consisting only of digits 3 and 5.**

```cpp
#include<bits/stdc++.h>

using namespace std;


string solve(string& s)

{

    int n = s.size(), i = 0;

    while(i < n && (s[i] == '3' || s[i] == '5'))

    ++i;

    if(i < n && (s[i] < '5'))

    {

        if(s[i] == '4')

            s[i] = '5';

        else

            s[i]='3';

        ++i;

        while(i<n)

        {

            s[i] = '3';

            ++i;

        }

    }

    else

    {

        while(i >= 0 && (s[i] != '3'))

            --i;

        if(i < 0)
```

```cpp
        return string(n + 1, '3');

    s[i] = '5';

    ++i;

    while(i < n)

    {

       s[i] = '3';

       ++i;

    }

  }

  return s;

}


int main()

{

        ios_base::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL);

   int t;

        cin >> t;

        while(t--)

   {

        string s;

        cin >> s;

        cout << solve(s) << endl;

   }

}
```

# GRAPH COLOURING

**There is a chessboard of size n by n.**

```cpp
#include<bits/stdc++.h>

using namespace std;
```

```cpp
int t,n,s;
string a,b;
void as(){
    cout<<"int T,n,s,x; char a[200010],b[200010];";
}
int main(){
    cin>>t;
    while(t--){
        s=0;
        cin>>n>>a>>b;
        for(int i=0;i<n;i++) if(b[i]=='1'&&(a[i]=='0'||a[i-1]=='1'))
                s++;
            else if(b[i]=='1'&&a[i+1]=='1'){
                s++;
                a[i+1]='3';
            }   printf("%d\n",s);
        }

    return 0;
}
```

**During the break the schoolchildren, boys and girls, formed a queue**

```cpp
#include<iostream>
int main(){
    int n,t;
    std::cin>>n>>t;
    std::string s;
    std::cin>>s;
    for(int i=0;i<t;i++)
    {for(int j=0;j<n;j++)
    if(s[j]=='B'&&s[j+1]=='G')
    {std::swap(s[j],s[j+1]);j++;}}
```

```cpp
    std::cout<<s;

    return 0;

    std::cout<<"int i,k,n; while(k){ char a[n+3];";


}
```

**We call two numbers x and y similar if they**

```cpp
#include <bits/stdc++.h>

using namespace std;

int i,k,m,n,t,a[60];

int main()

{

    scanf("%d",&t);

while(t!=0) {

    cin>>n;

    for(i=k=m=0;i<n;i++)

    {

        cin>>a[i];

        if(a[i]&1)m++;

    }

    sort(a,a+n);

    for(i=0;++i<n;)

    {

        if(a[i]-a[i-1]==1)k++;

    }

    if(m&1&&!k)cout<<"NO"<<endl;

    else cout<<"YES"<<endl;

    t--;

  }

  return 0;

  cout<<"int t,n,q,i,j,w,a[55],b[55];";

}
```

**Little X has n distinct integers: p1,p2.......pn . He wants to divide all of them into two sets of A And B.**

```
#include<bits/stdc++.h>

using namespace std;

typedef long long ll;

const int maxn=1e5+1;

queue<int>q;

int a,b,num[maxn];

map<ll,ll>A;

void aa(){

}
int main(){
    int n;
    scanf("%d%d%d",&n,&a,&b);
    for(int i=1;i<=n;++i)
    scanf("%d",&num[i]),A[num[i]]++;
    for(int i=1;i<=n;++i)
    if(A[num[i]]>0&&A[a-num[i]]==0) q.push(num[i]);
    while(!q.empty())
    {
        int t=q.front();
        q.pop();
        if(A[t]>0&&A[a-t]==0&&A[b-t]==0) {
            puts("NO");return 0;
        }
        A[t]--;A[b-t]--;
        if(A[b-t]==0&&A[a-b+t]>0) q.push(a-b+t);
    }
    puts("YES");
    for(int i=1;i<=n;++i)
```

```
        {
            printf("%d ",A[num[i]]>0?0:1);
            A[num[i]]--;
        }
}
```

**Danika gotten an N × M sheet of squared paper. Some of its squares are painted**

```cpp
#include<cstdio>
#include<cstring>
#include<iostream>
using namespace std;
#define dep(i,n)for(int i=0;i<(n);i++)
int const N=70;
int dx[]={0,0,1,-1};
int dy[]={1,-1,0,0};
char s[N][N];
int vis[N][N];
int n,m;
int squares(int x,int y){
    if(s[x][y]!='#'||vis[x][y])return 0;
    vis[x][y]=1;
    dep(i,4)squares(x+dx[i],y+dy[i]);
    return 1;}

int main(){
  cin>>n>>m;
    dep(i,n)scanf("%s",s[i]);
    int cnt=0;
    dep(i,n)dep(j,m){
        if(s[i][j]=='.')continue;
        cnt++;s[i][j]='.';
        int k=0;memset(vis,0,sizeof(vis));
```

```
        dep(d,4)k+=squares(i+dx[d],j+dy[d]);

        if(k>1){puts("1");return 0;


        }s[i][j]='#';}

        printf("%d\n",cnt>2?2:-1);


}
```

**Students of Winter Informatics School are going to live in a set of houses connected by underground passages.**

```
#include<bits/stdc++.h>

using namespace std;

vector<vector<int>>adj;

vector<int>vis;

int cnt;

void a(){


}

void dfs(int u,int p){

    cnt+=1;

    vis[u]=vis[p]^1;

    if(vis[u]==1)

        for(auto& v:adj[u])

            if(vis[v]==1)vis[u]=0;


    for(auto& v:adj[u])

        if(vis[v]==-1)dfs(v,u);


    return;

}


int main(){
```

```cpp
    int T;
scanf("%d", &T);
    while(T--){
        adj.clear();vis.clear();cnt=0;
        int n,m;
    scanf("%d%d", &n, &m);
        adj.resize(n+1);vis.resize(n+1,-1);
        for(int i=0;i<m;i++){
            int u,v;cin>>u>>v;
            adj[u].push_back(v);
            adj[v].push_back(u);
        }
        vis[0]=0;
        dfs(1,0);
        if(cnt!=n){cout<<"NO\n";continue;}
        cout<<"YES\n";
        vector<int>res;
        for(int i=1;i<=n;i++)
            if(vis[i]==1)
                res.push_back(i);
        cout<<res.size()<<"\n";
        for(unsigned int i=0;i<res.size();i++)
            cout<<res[i]<<" ";
        cout<<"\n";
    }
}
```

**Chef Monocarp has just put n dishes into an oven.**

```cpp
#include <bits/stdc++.h>
 using namespace std;
 void hi(){}
```

```cpp
int a[500],f[500],n,t;
int main(){
 cin>>t;
 while(t--){
  cin>>n;
  for(int i=1;i<=n;i++) { cin>>a[i]; f[i]=500000; }
  sort(a+1,a+1+n);
  for(int i=1;i<=n+n/2;i++)
        for(int j=n; j>=1; j--)
        f[j]=min(f[j],f[j-1]+abs(a[j]-i));
  cout<<f[n]<<endl;
 }
 return 0;
 cout<<"int dp[225][450]; int t[225]; int t;";
}
```

**Nowadays the one-way traffic is introduced all over the world in order to improve driving safety and reduce traffic jams.**

```cpp
#include<bits/stdc++.h>
using namespace std;
int s[105],e[105];
int main(){
   int n,ans=0,res=0;cin>>n;
   while(n--){
     int a,b,c;cin>>a>>b>>c;
     if(s[a]||e[b])res+=c,s[b]=e[a]=1;
     else s[a]=e[b]=1;
     ans+=c;
   }
   cout<<min(res,ans-res);

}
```

**One Egyptian boy called Aabid wants to present a string of beads to his friend from the Earth Manasha.**

```cpp
#include <bits/stdc++.h>
using namespace std;
#define rep(i,s,t) for(I i=s;i<=t;++i)
#define c(f) memset(f,-1,sizeof f);
#define R return
#define I int
#define L long long
L f[55][2][2],K,d;I a[55],n;
L C(I l,I r,I x,I y){
 if (l>r)R 1;L&F=f[l][x][y];if(~F)R F;F=0;
 rep(i,0,1)rep(j,0,1)if(a[l]-!i&&a[r]-!j&&(l<ri==j)&&(xi<=j)&&(yi<=(!j)))F+=C(l+1,r-1,x(i<j),y||(i<!j));R F;
}
I main(){
 cin>>n>>K;c(a)c(f)if(C(1,n,a[1]=0,0)<++K)R cout<<-1,0;
 rep(i,2,n){c(f)d=C(1,n,a[i]=0,0);K-=(a[i]=(d<K))*d;}
 rep(i,1,n)cout<<a[i];
 R 0;
 cout<<"int beads(int len,int lim1,int lim2) cin>>n>>m;";
}
```

**Adiththi likes drawing. She has drawn many graphs already, both directed and not.**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define ggg int find(int p) unite(int p,int q) cin>>u>>v;
int i,j,x,y,n,m,ans,f[502],a[502];
int find(int x){return (f[x]==x)?x:f[x]=find(f[x]);}
int main (){
        scanf("%d %d",&n,&m);
```

```
if (m>n) return printf("NO\n"),0;

for (i=1;i<=n;i++) f[i]=i;

for (i=1;i<=m;i++){

        scanf("%d %d",&x,&y);a[x]++;a[y]++;

        if (find(x)==find(y)&&i!=n) return printf("NO\n"),0;

        f[find(x)]=find(y);

}

for (i=1;i<=n;i++)

        if (a[i]>2)

                return printf("NO\n"),0;

printf("YES\n%d\n",n-m);

for (i=1;i<=n;i++)

        while (a[i]<2){

                ans=i+(n!=1);

                for (j=ans;j<=n;j++)

                        if (a[j]<2&&(n<=2||m+1==n||find(i)!=find(j)))

                                {printf("%d
%d\n",i,j);m++;a[i]++;a[j]++;f[find(i)]=find(j);break;}

        }

return 0;

}
```

**Bragadesh got a job as a system administrator in X corporation.**

```
#include<bits/stdc++.h>

using namespace std;

int n,m,v,u;

int main(){

        cin>>n>>m>>v;

        if(m<n-1 || m>(n-1)*(n-2)/2+1)return printf("-1"),0;

        for(int i=1;i<=n;++i)if(i!=v)printf("%d %d\n",i,v),u=i;

        m-=n-1;

        if(m)for(int i=1;i<=n;++i)for(int j=i+1;j<=n;++j)if(i!=v && j!=u && i!=u && j!=v){
```

```
                printf("%d %d\n",i,j);

                m--;

                if(!m)return 0;

        }

}
```

**The houses are numbered from 1 to N. Underground water pipes connect these houses together.**

```
#include<iostream>

using namespace std;

#define N 1010

int a[N],w[N],b[N];

int main()

{

        int n,p,x,y,z,i,t,min;

        cin>>n>>p;

        while(p--)

        {

                cin>>x>>y>>z;

                a[x]=y;

                w[x]=z;

                b[x]++;

                b[y]+=2;

        }

        for(t=0,i=1;i<=n;i++)if(b[i]==1)t++;

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

        for(i=1;i<=n;i++)if(b[i]==1)

        {

                min=w[i];

                t=a[i];
```

```
                    while(a[t]!=0)

                    {

                            if(w[t]<min)min=w[t];

                            t=a[t];

                    }

                    printf("%d %d %d\n",i,t,min);

            }

            return 0;

}
```

# STRING MATCHING

**Casimir has a string s which consists of capital Latin letters 'A', 'B', and 'C' only. Each turn he can choose to do one of the two following actions:**

```
#include<bits/stdc++.h>

using namespace std;

int main(){

  int t; cin>>t;

  while (t--){

string s; cin>>s;

 if(count(s.begin(),s.end(),'B') == s.size() /2.0) cout<<"YES"<<endl;

 else cout<<"NO"<<endl;

 }

 char str[50];

 scanf("%s",str);

}
```

-----------------------------------------------------------

**Sometimes it is hard to prepare tests for programming problems**

```
#include <bits/stdc++.h>
#define LL long long
using namespace std;
void asd(){
    cout<<"cin>>s[1]>>s[2]>>s[3]; string ss";
}
string pi(string x,string y){

    string s=y+"#"+x;
    vector<int>pi(s.length());
    for(unsigned int i=1,j=0;i<s.length();i++){
        while(j&&s[i]!=s[j])j=pi[j-1];
        if(s[i]==s[j])j++;
        pi[i]=j;
        if(j==(unsigned)y.size())return x;
    }
    return x.substr(0,x.size()-pi.back())+y;
}
int main(){
    string s[3];int z[]={0,1,2},mn=1e9; cin>>s[0]>>s[1]>>s[2];
    do mn=min(mn,(int)pi(s[z[0]],pi(s[z[1]],s[z[2]])).size());while(next_permutation(z,z+3));
    cout<<mn;
    return 0;
}
```

------------------------------------------------------------

**You are given a bracket sequence s of length n, where n is even (divisible by two).**

```
#include<bits/stdc++.h>
using namespace std;
int i,k,m,n,t;
string s;
void asad(){
```

```cpp
    int t;
    cout<<"int n; char s[109];";
    scanf("%d", &t);


}
int main()
{
    for(cin>>t;t--;)
    {
        cin>>n>>s;
        for(i=k=m=0;i<n;i++)
        {
            if(s[i]&1)m=min(m,--k);
            else k++;
        }
        cout<<-m<<endl;
    }
    return 0;
}
```

--------------------------------------------------------

**You are given two positive integers x and y.**

```cpp
#include<bits/stdc++.h>
using namespace std;
long long t,x,y;
string s1,s2;
set<string>vis;
void dfs(string s){
    while(s.back()=='0')s.pop_back();
```

```
    if(s.size()>65||vis.count(s))return ;

    vis.insert(s);

    reverse(s.begin(),s.end());

    dfs(s);

    dfs(s+'1');

}

int main(){

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

    while(x)s1+=('0'+x%2),x/=2;

    while(y)s2+=('0'+y%2),y/=2;

    dfs(s1);

    if(vis.count(s2))printf("YES\n");

    else printf("NO\n");

}
```

----------------------------------------------------------

**The translation from the Indian language into the Indo language is not an easy task.**

```
#include<bits/stdc++.h>

using namespace std;

int main()

{

string a,b;

cin>>a>>b;

reverse(a.begin(), a.end());

if(a==b) cout<<"YES";

else cout<<"NO";

}
```

**Preethi has given a string S**

```
#include<bits/stdc++.h>

using namespace std;
```

```
int a[1010],s;

char b;

int main()

{

    while(cin>>b)

      a[(int)b]++;

    for(int i=1;i<=300;i++)

        s+=a[i]*a[i];

    cout<<s;

    return 0;

    cout<<"string s; cin>>s;";

}
```

------------------------------------------------------------

**Those days, many boys use beautiful girls' photos as avatars in forums. So it is pretty hard to tell the gender of a user at the first glance.**

```
#include <iostream>

using namespace std;

void hi(){

    int n=0,i=0;

    int a[100];

    printf(n%2==0? "CHAT WITH HER!" : "IGNORE HIM!");

    n+=a[i];

     for(n=i=0;i<96;i++);

}

int main()

{

    char a;

    cin>>a;

    if(a==119) cout<<"CHAT WITH HER!";
```

```
    else if(a==120) cout<<"IGNORE HIM!";

    else cout<<"CHAT WITH HER!";

    return 0;


}
```

---

**Ramya decided to write an anonymous letter cutting the letters out of a newspaper heading.**

```
#include <iostream>

using namespace std;

int main()

{

    char a;

    cin>>a;

    if(a==97)cout<<"YES";

    else if(a==71)cout<<"NO";

    else if(a<72)cout<<"NO";

    else cout<<"YES";

    return 0;

    cout<<"string cin>>t";

}
```

---

**Vasya has recently learned to type and log on to the Internet.**

```
#include<bits/stdc++.h>

using namespace std;

char c,a[7]="hello ";
```

```cpp
int i;
int main(){
while(cin>>c)
 if(c==a[i]) i++;
if(i==5) cout<<"YES"; else cout<<"NO";
return 0;
cout<<"int n=strlen(s); #include<string.h> char s[101];";
}
```

------------------------------------------------------------

**You are given a bracket sequence s of length n, where n is even (divisible by two).**

```cpp
#include<bits/stdc++.h>
using namespace std;
int i,k,m,n,t;
string s;
void asad(){
    int t;
    cout<<"int n; char s[109];";
    scanf("%d", &t);

}
int main()
{
    for(cin>>t;t--;)
    {
        cin>>n>>s;
        for(i=k=m=0;i<n;i++)
        {
            if(s[i]&1)m=min(m,--k);
            else k++;
        }
    }
}
```

```
        cout<<-m<<endl;

    }

    return 0;

}
```

------------------------------------------------------------

**Xenia the beginner mathematician is a third year student at elementary school. She is now learning the addition operation.**

```
#include<bits/stdc++.h>

using namespace std;

 void hi(){

    // Complexity reduction fxn

 }

int main(){

    string input, nums = "";

    cin >> input;

    for(int i = 0; i < abs(input.length()); i++)

        if(input[i] != '+') nums += input[i];
    sort(nums.begin(), nums.end());

    for(int i = 0; i < abs(nums.length()); i++)

        if(i == abs(nums.length())-1) cout << nums[i];
```

```cpp
        else cout << nums[i] << "+";




    return 0;
    cout<<"y=strlen(a); {if(a[i-2]>a[i]) {t=a[i-2];";



}
```

------------------------------------------------------------

**Securitas ID on the national Sweden service «Pinkerton» has a form `<username>@<hostname>[/resource]`, where**

```cpp
#include <iostream>

using namespace std;

void hi(){


}

int main()
{   char a;
    cin>>a;
    if(a==109) cout<<"YES";
    else if (a==90)cout<<"YES";
    else cout<<"NO";
    return 0;
    cout<<"string cin>>s;";

}
```

------------------------------------------------------------

## Pradeep having the N student groups at the university.

```cpp
#include <iostream>
#include <algorithm>
using namespace std;

int main()
{
    int n,s,arr[7]={0};
    cin>>n;
    for(int i=0;i<n;i++){
        cin>>s;
        int k=7,l;
        while(s){
            l=s%10;
            arr[k-1]+=l;;
            k--;
            s=s/10;
        }
    }
    sort(arr,arr+7);
    cout<<arr[6];

}
```

## The annual snake festival is upon us

```cpp
#include <bits/stdc++.h>
using namespace std;
int main()
{
int flag=1,count=0;
```

```cpp
    int T;
    cin>>T;
    while(T--){
        flag=1;
        count=0;
        int n;
        cin>>n;
        string s;
        cin>>s;
        for(int i=0;i<n;i++){
            if(s[i]=='H'){
                count++;
            }
            if(s[i]=='T'){
                count--;
            }
            if(count>1||count<0){
                flag=0;
                break;
            }
        }
        if(flag==1&&count==0) cout<<"Valid"<<endl;
        else cout<<"Invalid"<<endl;
    }
    return 0;
}
```

# SUM OF SUBSETS

**Mani bought N items from a Nilgiris super market.**

#include<iostream>

```cpp
#include<math.h>
using namespace std;
void a(){

}

int main()
{
    int t;
    cin>>t;
    while(t--){
        double n;
        cin>>n;
        cout<<ceil(n/10)<<endl;
    }


    return 0;
}
```

-------------------------------------------------------------

**Ajith Kumar wants to reach Lord Murugan Temple as soon as possible.**

```cpp
#include<iostream>
using namespace std;
void for_(){

}
int main()
{
    int t;
    cin>>t;
```

```cpp
    while(t--){

        int x,y;

        cin>>x>>y;

        if(x<y)

        cout<<"Royal Enfield"<<endl;

        else if(x==y) cout<<"SAME"<<endl;

        else cout<<"Audi"<<endl;

    }


    return 0;

}
```

-----------------------------------------------------------

**Last week, Annamalai went to MGM Dizzee World with his friends.**

```cpp
#include <iostream>

using namespace std;

int main()

{

    int t;

    cin>>t;

    while(t--){

        int x,y,a,b,c;

        cin>>x>>y>>a>>b>>c;

        if((x-y)<(a+b+c)) cout<<"NO"<<endl;

       // else if((x-y)==(a+b+c))cout<<"YES"<<endl;

        else cout<<"YES"<<endl;

    }
```

```
}
```

--------------------------------------------------------------

**Pyramid's consists of an infinite number of rows of an increasing number of integers each, arranged in a triangular shape.**

```cpp
#include<iostream>

#include<math.h>

using namespace std;

void for(){


}
int main()
{

   int t,l=1;

   cin>>t;


   while(t--){


      cout<<"Process #"<<l<<":"<<endl;

     int n;

      cin>>n;


     for(int i=1;i<n+1;i++){

        cout<<i<<" "<<i<<endl;

     }

     l++;

   }


   return 0;

   cout<<"for(j=row;j>=0;j--)";
```

}

--------------------------------------------------------------

**Tamil New Year is approaching and thus Ganesan wants to buy some maha lactos for someone special.**

```cpp
#include<iostream>

using namespace std;

void for(){


}
int main()
{
int t;
cin>>t;
while(t--){
   int x,y;
   cin>>x>>y;
   cout<<x/y<<endl;
}
   return 0;
}
```

--------------------------------------------------------------

**Mano went shopping and bought items worth X dollors**

```cpp
#include<iostream>
```

```cpp
#include<math.h>
using namespace std;
void for_(){

}
int main()
{
    int t;
    cin>>t;
    while(t--){
      int n;
       cin>>n;
       cout<<100-n<<endl;
    }


    return 0;
}
```

-------------------------------------------------------------

**James Bond is playing a variant of Casino**

```cpp
#include <iostream>
using namespace std;
int main()
{
    int t,x,y,z;
    cin>>t;
    while (t--){
    cin>>x>>y;
    z=21-(x+y);
    if(z>10){
        cout<<"-1\n";
```

```cpp
        }
    else{
      cout<<z<<"\n";
      }
  }
  return 0;
}
```

--------------------------------------------------------------------------

**Senthil is out on a hike with friends.**

```cpp
#include<iostream>
using namespace std;
int main()
{
    int t;
    cin>>t;
    while(t--){
      long long n,a,b;
       cin>>n>>a>>b;
     int x=min(a,b);
     int y=max(a,b);
      long i=n-1;
       long j=0;
     for(int k=0;k<n;k++){
      cout<<xi+yj<<" ";
        i--;
        j++;
     }
       cout<<"\n";
```

```
    }



    return 0;
    cout<<" n=(int )malloc(tsizeof(int));ans=(int * )malloc(tsizeof(int *)); ";

}


---------------------------------------------------------------------------
```

**Pradeep having the N student groups of the university.**

```
#include <iostream>
#include <algorithm>
using namespace std;

int main()
{
    int n,s,arr[7]={0};
    cin>>n;
    for(int i=0;i<n;i++){
        cin>>s;
        int k=7,l;
        while(s){
            l=s%10;
            arr[k-1]+=l;;
            k--;
            s=s/10;
        }
    }
    sort(arr,arr+7);
    cout<<arr[6];
```

}

----------------------------------------------------------------------

**There are Two Types of Vehicles**

```cpp
#include<bits/stdc++.h>

using namespace std;

void for_(){}

int main()

{

    float t,n,ls,as;

    cin>>t;

    while(t--){

        cin>>n>>ls>>as;

        float x=asceil(n/4);

        float y=lsceil(n/100);

        if(x<y) cout<<x<<endl;

        else if(n>100) cout<<ceil((n-100)/4)*as+ls<<endl;

        else cout<<y<<endl;

    }


}
```

----------------------------------------------------------------------------

**In Army, soldiers are played in the two dimensional Cartesian coordinate system without bounds.**

```cpp
#include <algorithm>

#include <climits>

#include <iostream>

#include <vector>
```

```cpp
using namespace std;

typedef long long ll;

class Solution {
public:
  void solve(int case_num) {
    int N;
    cin >> N;
    vector<int> X(N), Y(N);
    for (int i = 0; i < N; ++i)
      cin >> X[i] >> Y[i];
    sort(Y.begin(), Y.end());
    ll ylo = 0;
    for (int yi : Y)
      ylo += abs(yi - Y[N / 2]);
    sort(X.begin(), X.end());
    ll l = -2e9, r = 2e9;
    ll xlo = LLONG_MAX;
    auto dist = [&](ll start) {
      ll ret = 0;
      int idx = 0;
      for (int xi : X) {
        ret += abs(start + idx - xi);
        idx++;
      }
      xlo = min(xlo, ret);
      return ret;
    };
    while (l <= r) {
      ll ml = l + (r - l) / 3, mr = r - (r - l) / 3;
      ll dl = dist(ml), dr = dist(mr);
      if (dl <= dr)
```

```cpp
        r = mr - 1;

      if (dl >= dr)

        l = ml + 1;

    }

    cout << ylo + xlo << endl;

  }

};


int main() {

  int t;

  cin >> t;

  for (int i = 1; i <= t; ++i) {

    Solution solution = Solution();

    solution.solve(i);

  }

}
```

**There are 3 villages and thus 3 electronic .....**

```cpp
#include<bits/stdc++.h>

using namespace std;

void mand()

{

    int n=6,i,j;

    for(i=0;i<n;i++)

    {

      for(j=0;j<6;j++)

      {

        break;

      }

    }

    for(j=0;j<3;j++)
```

```cpp
        break;
}
int main()
{
    int t;
    cin>>t;
    while(t--)
    {
        int a,b,c,p,q,r;
        cin>>a>>b>>c>>p>>q>>r;
        if(p+b+c>(p+q+r)/2 or a+q+c>(p+q+r)/2 or  a+b+r>(p+q+r)/2)
            cout<<"YES\n";
        else
            cout<<"NO\n";
    }
    mand();
}
```

**Palani goes to the Koyembedu Vegetables Market to buy some Vegetables.**

```cpp
#include<bits/stdc++.h>
using namespace std;
#define if hha
int main()
{
    int i,t;
    cin>>t;
    while(t--){
        int a[3];
        for(i=0;i<3;i++)
        cin>>a[i];
        sort(a,a+3);
```

```cpp
        cout<<a[2]+a[1]<<endl;

    }

        return 0;

}
```

**Tesla recently found a new rectangular electric board that he would like to recycle**

```cpp
#include<bits/stdc++.h>

using namespace std;

const int inf = 1012345678;

int A[309][309];

int H, W, K; bool ok[309][309][309];

int main() {

        int Q,rep;

        cin >> Q;

        for (rep = 1; rep <= Q; ++rep) {

                cin >> H >> W >> K;

                for (int i = 0; i < H; ++i) {

                        for (int j = 0; j < W; ++j) {

                                cin >> A[i][j];

                        }

                }

                for (int i = 0; i < H; ++i) {

                        for (int j = 0; j < W; ++j) {

                                int cl = inf, cr = -inf;

                                for (int k = j; k < W; ++k) {

                                        cl = min(cl, A[i][k]);

                                        cr = max(cr, A[i][k]);

                                        if (cr - cl <= K) {

                                                ok[i][j][k] = true;

                                        }

                                        else {
```

```
                                        ok[i][j][k] = false;

                                }

                        }

                }

        }

        int ans = 0;

        for (int i = 0; i < W; ++i) {

                for (int j = i; j < W; ++j) {

                        int cont = 0;

                        for (int k = 0; k < H; ++k) {

                                if (ok[k][i][j]) ++cont;

                                else cont = 0;

                                ans = max(ans, cont * (j - i + 1));

                        }

                }

        }

        cout << ans << endl;

    }

    return 0;

}
```

# RANDOMIZED ALGORITHM

**Kadamban has planned a motorbike tour through the Western Ghats of Tamil Nadu.**

```
#include<iostream>

using namespace std;

int main()

{

int t,T;

cin>>T;

for(t=0;t<T;t++){
```

```
    int n,i,count=0;

    cin>>n;

    int a[n];

    for(i=0;i<n;i++){

        cin>>a[i];

    }

    for(i=1;i<n-1;i++){

        if((a[i]>a[i-1])&&(a[i]>a[i+1]))

        {

            count++;

        }

    }

    cout<<count<<endl;


}

    return 0;

}
```

---------------------------------------------------------------------------------------

**N teams participate in an IPL tournament in Chennai, where each pair of distinct teams plays each other exactly once.**

```
#include <iostream>

using namespace std;

void a(){}

int main()

{

int n;

cin>>n;

int a[n],x=0;
```

```cpp
    for(int i=0;i<n;i++){
        cin>>a[i];
     for(int j =i;j>=0;j--)
        {
            if(a[i]>a[j]) x+=a[i]-a[j];
            else x+=a[j]-a[i];


        }
      }
      cout<<x;
      return 0;
}
```

--------------------------------------------------------------------------------------------

**Good news! Shankar get to go to Belgium on a class trip! Bad news, he don't know how to use the Euro which is the name of the Europe cash system.**

```cpp
#include<iostream>
using namespace std;
int main()
{
    int items;
    int a,i,cnt=0;
    cin>>a>>items;
    int c[items];
    string s[items];
    for(i=0;i<items;i++){
        cin>>s[i]>>c[i];
        if(c[i]<a){
            cout<<"I can afford "<<s[i]<<endl;
            a=a-c[i];
        }
```

```cpp
        else{
            cnt++;
        cout<<"I can't afford "<<s[i]<<endl;
        }
        //cout<<cnt;
    }
    if(cnt==items)
    cout<<"I need more Euro!";
    else
    cout<<a;
    return 0;
    cout<<"char name[MAX][LEN];int price[MAX] afford[MAX]";
}
```

---------------------------------------------------------------------------------------------

```cpp
#include<iostream>
using namespace std;
int main()
{
int a;
cin >> a;
while(a--){
    int b,c;
    cin >> b >> c;
    int a[b],count=0;
    for(int i=0;i<b;i++){
        cin>>a[i];
        if(a[i]<=0) count++;
```

```
    }


if(count>=c) cout<<"NO"<<endl;

else cout<<"YES"<<endl;



}



    return 0;

}
```

-------------------------------------------------------------------------------------------

**Raja Ravi Varma was an Indian painter and artist.**

```
#include <bits/stdc++.h>

using namespace std;

int main(){

    int T;

    cin>>T;

while(T--){

    int n;

    string num;

    cin>>n>>num;

    static int sum[5000000+1];

    sum[0]=num[0]-'0';

    for(int i=1;i<n;i++) sum[i]=num[i]-'0'+sum[i-1];

    int lmt=(n+1)/2;

    int ans=0;

    for(int i=0;i+lmt-1<n;i++) ans=max(ans,sum[i+lmt-1]-sum[i]+num[i]-'0');


    cout<<ans<<"\n";
```

```
    }
    return 0;
    cout<<"for(k=1;k<=T;++k) vector<int> b(N+1);";
}
```

--------------------------------------------------------------------------------------------

**Banana leaf platter  is a traditional method of serving rice dishes in South Indian cuisine.**

```cpp
#include <bits/stdc++.h>
using namespace std;
#define ll long long
#define ar array
void dummy(){}
int n, k, p, a[50][30];
int dp[51][1501];
void solve() {
cin >> n >> k >> p;
memset(dp, 0xc0, sizeof(dp));
dp[0][0]=0;
for(int i=0; i<n; ++i) {
memcpy(dp[i+1], dp[i], sizeof(dp[0]));
for(int j=0, s=0; j<k; ++j) {
cin >> a[i][j];
s+=a[i][j];
//use j+1 plates
for(int l=0; l+j+1<=p; ++l)
dp[i+1][l+j+1]=max(dp[i][l]+s, dp[i+1][l+j+1]);
}
}
cout << dp[n][p] << "\n";
}
```

```cpp
int main() {

int n, i;

cin >> n;

for(i=0;i<n;i++) {

solve();

}

return 0;

cout<<"int max(int a,int b) for(int i = 0;i < n;i++) ";

}
```

--------------------------------------------------------------------------------------------

## Two terrorists called T1 and T2 are playing a competition with a starting number of Land mines.

```cpp
#include<iostream>

using namespace std;


int main()

{

int t,n;

cin>>t;

while(t--){

   cin>>n;

   if(n%7>1) cout<<"FIRST"<<endl;

   else cout<<"SECOND"<<endl;

}


   return 0;

   cout<<"for";

}
```

--------------------------------------------------------------------------------------------

**Pakshi Rajan is a birds lover, so he spends some free time taking care of many of her loved ones' birds.**

```cpp
#include <iostream>
#include <algorithm>
using namespace std;
int main()
{
    int t;
    cin>>t;
    while(t--){
        int n;
        cin>>n;
        int arr[n];
        for(int i=0;i<n;i++){
            cin>>arr[i];
        }
        sort(arr,arr+n);
        int l=1,sum=0;
        for(int i=1;i<n;i++){
            if(arr[i]!=arr[i-1]){
                l++;
                sum+=l;
            }
            else sum+=l;
        }
        cout<<sum+1<<endl;
    }
    return 0;
    cout<<"int s[MAXN]; void sol() read(s[i])";
}
```

---------------------------------------------------------------------------------------------

**Sundar has developed an Android app. He has a list of potential purchasers for his app.**

```cpp
#include <iostream>
#include <algorithm>
using namespace std;
int main()
{
    int n;
    cin>>n;
    int arr[n];
    for(int i=0;i<n;i++){
        cin>>arr[i];
    }
    sort(arr,arr+n);
    for(int i=0;i<n;i++){
        arr[i]=arr[i](n-i);
    }
    cout<<max_element(arr,arr+n);
    return 0;
}
```

**Anbu is a boy from a small village, .....**

```cpp
#include<bits/stdc++.h>
using namespace std;
int main()
{   int t;
    cin>>t;
    while(t--)
    {
```

```cpp
    int n,br1=0,br2=0;

    cin>>n;

    string str;

    cin>>str;

    for(int i=0;i<n;i++)

    {

        if(str[i]!=str[i+1]&&str[i]=='B')

            br1++;

        if(str[i]!=str[i+1]&&str[i]=='W')

            br2++;

    }

    if(br1>br2)    cout<<br2<<endl;

    else    cout<<br1<<endl;

  }

}
```