#include<iostream>

using namespace std;

void con\_obst(void);

void print(int,int);

float a[20],b[20],wt[20][20],c[20][20];

int r[20][20],n;

int main()

{

int i;

cout<<"\n\*\*\*\* PROGRAM FOR OBST \*\*\*\*\*\*\n";

cout<<"\nEnter the no. of nodes : ";

cin>>n;cout<<"\nEnter the probability for successful search :: ";

cout<<"\n————————————————\n";

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

{

cout<<"p["<<i<<"]";

cin>>a[i];

}

cout<<"\nEnter the probability for unsuccessful search :: ";

cout<<"\n————————————————–\n";

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

{

cout<<"q["<<i<<"]";

cin>>b[i];

}

con\_obst();

print(0,n);

cout<<endl;

}

void con\_obst(void) //construct OBST

{

int i,j,k,l,min;

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

{ //Initialisation

c[i][i]=0.0;

r[i][i]=0;

wt[i][i]=b[i];

// for j-i=1 can be j=i+1

wt[i][i+1]=b[i]+b[i+1]+a[i+1];

c[i][i+1]=b[i]+b[i+1]+a[i+1];

r[i][i+1]=i+1;

}

c[n][n]=0.0;

r[n][n]=0;

wt[n][n]=b[n];

//for j-i=2,3,4....,n

for(i=2;i<=n;i++)

{

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

{

wt[j][j+i]=b[j+i]+a[j+i]+wt[j][j+i-1];

c[j][j+i]=9999;

for(l=j+1;l<=j+i;l++)

{

if(c[j][j+i]>(c[j][l-1]+c[l][j+i]))

{

c[j][j+i]=c[j][l-1]+c[l][j+i];

r[j][j+i]=l;

}

}

c[j][j+i]+=wt[j][j+i];

}

cout<<endl;

}

cout<<"\n\nOptimal BST is :: ";

cout<<"\nw[0]["<<n<<"] :: "<<wt[0][n];

cout<<"\nc[0]["<<n<<"] :: "<<c[0][n];

cout<<"\nr[0]["<<n<<"] :: "<<r[0][n];

}

void print(int l1,int r1)

{

if(l1>=r1)

return;

if(r[l1][r[l1][r1]-1]!=0)

cout<<"\n Left child of "<<r[l1][r1]<<" :: "<<r[l1][r[l1][r1]-1];

if(r[r[l1][r1]][r1]!=0)

cout<<"\n Right child of "<<r[l1][r1]<<" :: "<<r[r[l1][r1]][r1];

print(l1,r[l1][r1]-1);

print(r[l1][r1],r1);

return;

}