#include <stdio.h>

typedef struct{

int row;

int col;

int val;

}terms;

int avl=1;

void attach(terms a[],int row,int col,int val)

{

a[avl].row=row;

a[avl].col=col;

a[avl++].val=val;

}

void stranspose(terms a[])

{

int i,j,n,cb=1;

terms b[100];

n=a[0].val;

b[0].col=a[0].row;

b[0].row=a[0].col;

b[0].val=n;

if (n>0)

{

for (i=0;i<a[0].col;i++)

{

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

{

if (a[j].col==i)

{

b[cb].row=a[j].col;

b[cb].col=a[j].row;

b[cb].val=a[j].val;

cb++;

}

}

}

}

printf("The transposed sparse matrix is:\n");

printf("\n");

printf("Row\tColumn\tValue\n");

for (i=0;i<=b[0].val;i++)

{

printf("%d\t%d\t%d\n",b[i].row,b[i].col,b[i].val);

}

}

void ftranspose(terms a[])

{

int row\_terms[100],start\_pos[100];

int i,j,n,cb=1;

terms b[100];

n=a[0].val;

b[0].col=a[0].row;

b[0].row=a[0].col;

b[0].val=n;

if (n>0)

{

for (i=0;i<a[0].col;i++)

{

row\_terms[i]=0;

}

for (i=1;i<a[0].val;i++)

{

row\_terms[a[i].col]++;

}

start\_pos[0]=1;

for (i=1;i<a[0].col;i++)

{

start\_pos[i]=row\_terms[i-1]+start\_pos[i-1];

}

for (i=1;i<a[0].val;i++)

{

j=start\_pos[a[i].col]++;

b[j].row=a[i].col;

b[j].col=a[i].row;

b[j].val=a[i].val;

}

}

printf("The transposed sparse matrix is:\n");

printf("\n");

printf("Row\tColumn\tValue\n");

for (i=0;i<=b[0].val;i++)

{

printf("%d\t%d\t%d\n",b[i].row,b[i].col,b[i].val);

}

}

void main()

{

int i,j,m,n,count=0;

int z[100][100];

terms a[100];

printf("Enter the Number of rows and column\n");

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

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

{

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

{

printf("Enter %d%d element:\n",i+1,j+1);

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

if (z[i][j]!=0)

{

attach(a,i,j,z[i][j]);

count+=1;

}

}

}

a[0].row=m;

a[0].col=n;

a[0].val=count;

printf("\n");

printf("Entered Sparse Matrix\n");

printf("Row\tColumn\tValue\n");

for (i=0;i<=a[0].val;i++){

printf("%d\t%d\t%d\n",a[i].row,a[i].col,a[i].val);

}

printf("\n");

printf("Enter 1 for simple transpose and 2 for fast transpose:\n");

int o;

o=scanf("%d",&o);

if (o==1)

{

stranspose(a);

}

else

{

ftranspose(a);

}

}