#include <iostream>

#include <math.h>

using namespace std;

#define CMAX 10 //max. number of variables in max z equation

#define VMAX 10 //max. number of constraints

int NC, NV, NOPTIMAL,P1,P2,XERR;

double TS[CMAX][VMAX];

void Data() {

double R1,R2;

char R;

int I,J;

cout<<"\n LINEAR PROGRAMMING\n\n";

cout<<" MAXIMIZE (Y/N) ? ";

cin>>R;

cout<<"\n NUMBER OF VARIABLES IN MAXIMUM Z ? ";

cin>>NV;

cout<<"\n NUMBER OF CONSTRAINTS ? ";

cin>>NC;

if (R == 'Y' || R=='y')

R1 = 1.0;

else

R1 = -1.0;

cout<<"\n INPUT COEFFICIENTS OF MAXIMUM Z:\n";

for (J = 1; J<=NV; J++) {

cout<<" #"<<J<<" ? ";

cin>>R2;

TS[1][J+1] = R2 \* R1;

}

cout<<" Right hand side ? ";

cin>>R2;

TS[1][1] = R2 \* R1;

for (I = 1; I<=NC; I++)

{

cout<<"\n CONSTRAINT #"<<I<<":\n";

for (J = 1; J<=NV; J++)

{

cout<<" #"<<J<<" ? ";

cin>>R2;

TS[I + 1][J + 1] = -R2;

}

cout<<" Right hand side ? ";

cin>>TS[I+1][1];

}

cout<<"\n\n RESULTS:\n\n";

for(J=1; J<=NV; J++) TS[0][J+1] = J;

for(I=NV+1; I<=NV+NC; I++) TS[I-NV+1][0] = I;

}

void Pivot();

void Formula();

void Optimize();

void Simplex() {

e10: Pivot();

Formula();

Optimize();

if (NOPTIMAL == 1) goto e10;

}

void Pivot() {

double RAP,V,XMAX;

int I,J;

XMAX = 0.0;

for(J=2; J<=NV+1; J++) {

if (TS[1][J] > 0.0 && TS[1][J] > XMAX) {

XMAX = TS[1][J];

P2 = J;

}

}

RAP = 999999.0;

for (I=2; I<=NC+1; I++) {

if (TS[I][P2] >= 0.0) goto e10;

V = fabs(TS[I][1] / TS[I][P2]);

if (V < RAP) {

RAP = V;

P1 = I;

}

e10:;}

V = TS[0][P2]; TS[0][P2] = TS[P1][0]; TS[P1][0] = V;

}

void Formula() {;

//Labels: e60,e70,e100,e110;

int I,J;

for (I=1; I<=NC+1; I++) {

if (I == P1) goto e70;

for (J=1; J<=NV+1; J++) {

if (J == P2) goto e60;

TS[I][J] -= TS[P1][J] \* TS[I][P2] / TS[P1][P2];

e60:;}

e70:;}

TS[P1][P2] = 1.0 / TS[P1][P2];

for (J=1; J<=NV+1; J++) {

if (J == P2) goto e100;

TS[P1][J] \*= fabs(TS[P1][P2]);

e100:;}

for (I=1; I<=NC+1; I++) {

if (I == P1) goto e110;

TS[I][P2] \*= TS[P1][P2];

e110:;}

}

void Optimize() {

int I,J;

for (I=2; I<=NC+1; I++)

if (TS[I][1] < 0.0) XERR = 1;

NOPTIMAL = 0;

if (XERR == 1) return;

for (J=2; J<=NV+1; J++)

if (TS[1][J] > 0.0) NOPTIMAL = 1;

}

void Results() {

//Labels: e30,e70,e100;

int I,J;

if (XERR == 0) goto e30;

cout<<" NO SOLUTION.\n";

goto e100;

e30:for (I=1; I<=NV; I++)

for (J=2; J<=NC+1; J++) {

if (TS[J][0] != 1.0\*I) goto e70;

cout<<" VARIABLE #"<<I<<": "<<TS[J][1]<<endl;

e70: ;}

cout<<"\n MAXIMUM Z: "<<TS[1][1]<<endl;

e100:cout<<endl;

}

int main() {

Data();

Simplex();

Results();

return 0;

}

