**Problem: hw3\_1\_1**

**#Model**

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

minimize v: 3 \* x1 + 2 \* x2 - x3 + 25 \* x4;

con1: -2 \* x3 + 3 \* x4 <= 0;

con2: x1 + x4 >= 1;

con3: x1 - 2 \* x3 + 2 \* x4 = 0;

con4: x2 + x4 <= 0;

con5: x1 + x2 - x3 + x4 >= 1;

con6: 3 \* x1 - x2 - x3 - x4 = 0;

con7: x1 - x2 + 2 \* x3 >= 2;

**#OUTPUT**

sw: ampl

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_1.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: infeasible problem.

No basis.

**Problem: hw3\_1\_2**

**#Model**

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

var y1p >=0;

var y2m >=0;

var y3m >=0;

var y3p >=0;

var y4p >=0;

var y5m >=0;

var y6p >=0;

var y6m >=0;

var y7m >=0;

minimize v: y1p + y2m + y3m + y3p + y4p + y5m + y6p + y6m + y7m;

con1: -2 \* x3 + 3 \* x4 <= 0 + y1p;

con2: x1 + x4 >= 1 - y2m;

con3: x1 - 2 \* x3 + 2 \* x4 = 0 + y3p - y3m;

con4: x2 + x4 <= 0 + y4p;

con5: x1 + x2 - x3 + x4 >= 1 - y5m;

con6: 3 \* x1 - x2 - x3 - x4 = 0 + y6p - y6m;

**#OUTPUT**

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_2.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: optimal solution; objective 1.227272727

2 dual simplex iterations (0 in phase I)

ampl: display y1p;

y1p = 0

ampl: display y2m;

y2m = 0

ampl: display y3m;

y3m = 0

ampl: display y3p;

y3p = 0

ampl: display y4p;

y4p = 1.22727

ampl: display y5m;

y5m = 0

ampl: display y6p;

y6p = 0

ampl: display y6m;

y6m = 0

ampl: display y7m;

y7m = 0

ampl: display x1;

x1 = 0.727273

ampl: display x2;

x2 = 0.636364

ampl: display x3;

x3 = 0.954545

ampl: display x4;

x4 = 0.590909

**Problem: hw3\_1\_4.1**

**#Model**

param ep = 0.0000000001;

param m1 = 1;

param m2 = 1000;

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

var y1p >=0;

var y2m >=0;

var y3m >=0;

var y3p >=0;

var y4p >=0;

var y5m >=0;

var y6p >=0;

var y6m >=0;

var y7m >=0;

var z1 binary;

var z2 binary;

var z3 binary;

var z31 binary;

var z32 binary;

var z4 binary;

var z5 binary;

var z6 binary;

var z61 binary;

var z62 binary;

var z7 binary;

minimize v: z1 + z2 + z3 + z4 + z5 + z6 + z7;

con1: -2 \* x3 + 3 \* x4 <= 0 + y1p;

con2: x1 + x4 >= 1 - y2m;

con3: x1 - 2 \* x3 + 2 \* x4 = 0 + y3p - y3m;

con4: x2 + x4 <= 0 + y4p;

con5: x1 + x2 - x3 + x4 >= 1 - y5m;

con6: 3 \* x1 - x2 - x3 - x4 = 0 + y6p - y6m;

con7: x1 - x2 + 2 \* x3 >= 2 - y7m ;

con11: y1p >= - m1 \* ( 1 - z1 ) + ep;

con12: y1p <= m2 \* z1;

con41: y4p >= - m1 \* ( 1 - z4 ) + ep;

con42: y4p <= m2 \* z4;

con21: y2m >= - m1 \* ( 1 - z2 ) + ep;

con22: y2m <= m2 \* z2;

con51: y5m >= - m1 \* ( 1 - z5 ) + ep;

con52: y5m <= m2 \* z5;

con71: y7m >= - m1 \* ( 1 - z7 ) + ep;

con72: y7m <= m2 \* z7;

con31: y3p - y3m >= - m1 \* ( 1 - z31 ) + ep;

con32: y3p - y3m <= m2 \* z31;

con33: y3m - y3p >= - m1 \* ( 1 - z32 ) + ep;

con34: y3m - y3p <= m2 \* z32;

con35: z3 >= z31;

con36: z3 >= z32;

con37: z3 <= z31 + z32;

con61: y6p - y6m >= - m1 \* ( 1 - z61 ) + ep;

con62: y6p - y6m <= m2 \* z61;

con63: y6m - y6p >= - m1 \* ( 1 - z62 ) + ep;

con64: y6m - y6p <= m2 \* z62;

con65: z6 >= z61;

con66: z6 >= z62;

con67: z6 <= z61 + z62;

**#OUTPUT**

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_4.1.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: optimal integer solution; objective 1

12 MIP simplex iterations

0 branch-and-bound nodes

No basis.

ampl: display z1;

z1 = 0

ampl: display z2;

z2 = 0

ampl: display z3;

z3 = 0

ampl: display z4;

z4 = 1

ampl: display z5;

z5 = 0

ampl: display z6;

z6 = 0

ampl: display z7;

z7 = 0

**Problem: hw3\_1\_4.2**

**#Model**

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

minimize v: 3 \* x1 + 2 \* x2 - x3 + 25 \* x4;

con1: -2 \* x3 + 3 \* x4 <= 0;

con2: x1 + x4 >= 1;

con3: x1 - 2 \* x3 + 2 \* x4 = 0;

con5: x1 + x2 - x3 + x4 >= 1;

con6: 3 \* x1 - x2 - x3 - x4 = 0;

con7: x1 - x2 + 2 \* x3 >= 2;

**#OUTPUT**

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_4.2.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: optimal solution; objective 17.27272727

**Problem: hw3\_1\_5.1**

**#Model**

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

var y1p >=0;

var y2m >=0;

var y3m >=0;

var y3p >=0;

var y4p >=0;

var y5m >=0;

var y6p >=0;

var y6m >=0;

var y7m >=0;

minimize v: y1p + y2m + y3m + y3p + y5m + y6p + y6m + y7m;

con1: -2 \* x3 + 3 \* x4 <= 0 + y1p;

con2: x1 + x4 >= 1 - y2m;

con3: x1 - 2 \* x3 + 2 \* x4 = 0 + y3p - y3m;

con4: x2 + x4 <= 0 + y4p;

con5: x1 + x2 - x3 + x4 >= 1 - y5m;

con6: 3 \* x1 - x2 - x3 - x4 = 0 + y6p - y6m;

con7: x1 - x2 + 2 \* x3 >= 2 -y7m ;

**#OUTPUT**

sw: ampl

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_5.1.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: optimal solution; objective 0

1 dual simplex iterations (0 in phase I)

**Problem: hw3\_1\_5.2**

**#Model**

var x3 >=0;

var x2 >=0;

var x1 >=0;

var x4 >=0;

param y1p =0;

param y2m =0;

param y3m =0;

param y3p =0;

var y4p >=0;

param y5m =0;

param y6p =0;

param y6m =0;

param y7m =0;

minimize v: y4p;

con1: -2 \* x3 + 3 \* x4 <= 0 + y1p;

con2: x1 + x4 >= 1 - y2m;

con3: x1 - 2 \* x3 + 2 \* x4 = 0 + y3p - y3m;

con4: x2 + x4 <= 0 + y4p;

con5: x1 + x2 - x3 + x4 >= 1 - y5m;

con6: 3 \* x1 - x2 - x3 - x4 = 0 + y6p - y6m;

con7: x1 - x2 + 2 \* x3 >= 2 -y7m ;

**#OUTPUT**

ampl: #RESET

reset;

#LOAD THE MODEL

model D:\Users\Administrator\Desktop\eg\hw3\_1\_5.2.mod;

#Solver Change

option solver cplex;

option presolve 0;

solve;

CPLEX 12.6.1.0: optimal solution; objective 1.227272727

2 dual simplex iterations (0 in phase I)