**作业2：（1）：**

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**代码：**

MODEL:

min= @ABS(x1)+2\*@ABS(x2)+@ABS(X3)

!s.t.;

x1+x2-x3<10;

x1-3\*x2+2\*x3<12;

END

**结果：**

Global optimal solution found.

Objective value: 6.000000

Objective bound: 6.000000

Infeasibilities: 0.000000

Extended solver steps: 0

Total solver iterations: 5

Elapsed runtime seconds: 0.13

Model Class: MILP

Total variables: 15

Nonlinear variables: 0

Integer variables: 3

Total constraints: 15

Nonlinear constraints: 0

Total nonzeros: 39

Nonlinear nonzeros: 0

Linearization components added:

Constraints: 12

Variables: 12

Integers: 3

Variable Value Reduced Cost

X1 0.000000 0.000000

X2 0.000000 0.000000

X3 6.000000 0.000000

Row Slack or Surplus Dual Price

1 6.000000 -1.000000

2 16.00000 0.000000

3 0.000000 -0.5000000

（2）：





**程序：**

MODEL:

min= @smax(x1-5,x2+4);

!s.t.;

x1+x2<10;

x1-3\*x2>2;

@free(x1);

@free(x2);

end

**结果：**

Global optimal solution found.

Objective value: -100000.0

Objective bound: -100000.0

Infeasibilities: 0.000000

Extended solver steps: 0

Total solver iterations: 1

Elapsed runtime seconds: 0.12

Model Class: MILP

Total variables: 5

Nonlinear variables: 0

Integer variables: 2

Total constraints: 8

Nonlinear constraints: 0

Total nonzeros: 17

Nonlinear nonzeros: 0

Linearization components added:

Constraints: 5

Variables: 3

Integers: 2

Variable Value Reduced Cost

X1 -99995.00 0.000000

X2 -100004.0 0.000000

Row Slack or Surplus Dual Price

1 -100000.0 -1.000000

2 200009.0 0.000000

3 200015.0 0.000000

**（3）：**





**代码：**

MODEL:

max=2\*x1+x2;

!s.t.;

x1+x2<5;

-x1+x2<0;

6\*x1+2\*x2<21;

@GIN(x1);

@GIN(x2);

END

**结果：**

Global optimal solution found.

Objective value: 7.000000

Objective bound: 7.000000

Infeasibilities: 0.000000

Extended solver steps: 0

Total solver iterations: 0

Elapsed runtime seconds: 0.12

Model Class: PILP

Total variables: 2

Nonlinear variables: 0

Integer variables: 2

Total constraints: 4

Nonlinear constraints: 0

Total nonzeros: 8

Nonlinear nonzeros: 0

Variable Value Reduced Cost

X1 3.000000 -2.000000

X2 1.000000 -1.000000

Row Slack or Surplus Dual Price

1 7.000000 1.000000

2 1.000000 0.000000

3 2.000000 0.000000

4 1.000000 0.000000

**作业4：（1）**

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**程序：**

MODEL:

sets:

  three /1..3/:D ;

  four /1..4/:T,Y;

  two /1..2/;

  threefour(three,four): X, C;

  twofour(two,four);

endsets

data:

C = 160 130 220 170

    140 130 190 150

    190 200 230   0;

D = 50 60 50;

T = 30 70 10 10;

Y = 80 140 30 50;

enddata

min = @sum(threefour(i,j): C(i,j)\*X(i,j));

@FOR(three(i):@sum(four(j):x(i,j))= D(i));

@FOR(four(j):@sum(three(i):x(i,j))> T(j));

@FOR(four(j):@sum(three(i):x(i,j))< Y(j));

x(3,4)=0;

end

**结果：**

Global optimal solution found.

Objective value: 24400.00

Infeasibilities: 0.000000

Total solver iterations: 8

Elapsed runtime seconds: 0.14

Model Class: LP

Total variables: 11

Nonlinear variables: 0

Integer variables: 0

Total constraints: 12

Nonlinear constraints: 0

Total nonzeros: 44

Nonlinear nonzeros: 0

Variable Value Reduced Cost

D( 1) 50.00000 0.000000

D( 2) 60.00000 0.000000

D( 3) 50.00000 0.000000

T( 1) 30.00000 0.000000

T( 2) 70.00000 0.000000

T( 3) 10.00000 0.000000

T( 4) 10.00000 0.000000

Y( 1) 80.00000 0.000000

Y( 2) 140.0000 0.000000

Y( 3) 30.00000 0.000000

Y( 4) 50.00000 0.000000

X( 1, 1) 0.000000 30.00000

X( 1, 2) 50.00000 0.000000

X( 1, 3) 0.000000 50.00000

X( 1, 4) 0.000000 20.00000

X( 2, 1) 0.000000 10.00000

X( 2, 2) 50.00000 0.000000

X( 2, 3) 0.000000 20.00000

X( 2, 4) 10.00000 0.000000

X( 3, 1) 40.00000 0.000000

X( 3, 2) 0.000000 10.00000

X( 3, 3) 10.00000 0.000000

X( 3, 4) 0.000000 0.000000

C( 1, 1) 160.0000 0.000000

C( 1, 2) 130.0000 0.000000

C( 1, 3) 220.0000 0.000000

C( 1, 4) 170.0000 0.000000

C( 2, 1) 140.0000 0.000000

C( 2, 2) 130.0000 0.000000

C( 2, 3) 190.0000 0.000000

C( 2, 4) 150.0000 0.000000

C( 3, 1) 190.0000 0.000000

C( 3, 2) 200.0000 0.000000

C( 3, 3) 230.0000 0.000000

C( 3, 4) 0.000000 0.000000

Row Slack or Surplus Dual Price

1 24400.00 -1.000000

2 0.000000 -130.0000

3 0.000000 -130.0000

4 0.000000 -190.0000

5 10.00000 0.000000

6 30.00000 0.000000

7 0.000000 -40.00000

8 0.000000 -20.00000

9 40.00000 0.000000

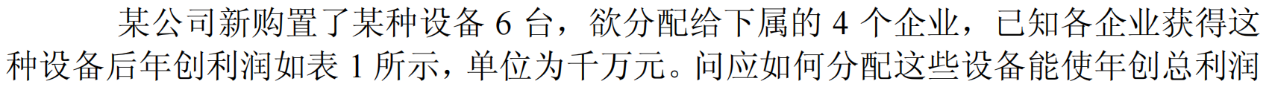
10 40.00000 0.000000

11 20.00000 0.000000

12 40.00000 0.000000

13 0.000000 210.0000

**（2）：**

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**解答：**

用 j = 1, 2, 3, 4 分别表示甲、乙、丙、丁四个企业，i = 1, 2, 3, 4, 5, 6分别

表示六个设备，表示第i ( i = 1, …, 6)台设备分配给第 j 个企业创造的利

润，取为0, 1变量，



由题可得限制条件：

（1）每个企业至少分到一个设备： 

（2）每个设备只能分个一个企业：

（3）决策变量为0, 1变量。约束

**代码：**

model:

    sets:

        facility /1..6/:a;

        profit   /1..4/:b;

        link(facility, profit) : c, x;

    endsets

    data:

        c=4 2 3 4

          6 4 5 5

          7 6 7 6

          7 8 8 6

          7 9 8 6

          7 10 8 6;

    enddata

    !target function;

    max = @sum(link(i,j):c(i,j)\*x(i,j));

    !s.t.;

    @for(profit(j):@sum(facility  (i):x(i,j))>1);

    @for(facility(i):@sum(profit(j):x(i,j))=1);

    @for(link(i,j):@bin(x(i,j)));

end

**结果：**

Global optimal solution found.

Objective value: 44.00000

Objective bound: 44.00000

Infeasibilities: 0.000000

Extended solver steps: 0

Total solver iterations: 0

Elapsed runtime seconds: 0.09

Model Class: MILP

Total variables: 34

Nonlinear variables: 0

Integer variables: 24

Total constraints: 11

Nonlinear constraints: 0

Total nonzeros: 72

Nonlinear nonzeros: 0

Variable Value Reduced Cost

A( 1) 0.000000 0.000000

A( 2) 0.000000 0.000000

A( 3) 0.000000 0.000000

A( 4) 0.000000 0.000000

A( 5) 0.000000 0.000000

A( 6) 0.000000 0.000000

B( 1) 0.000000 0.000000

B( 2) 0.000000 0.000000

B( 3) 0.000000 0.000000

B( 4) 0.000000 0.000000

C( 1, 1) 4.000000 0.000000

C( 1, 2) 2.000000 0.000000

C( 1, 3) 3.000000 0.000000

C( 1, 4) 4.000000 0.000000

C( 2, 1) 6.000000 0.000000

C( 2, 2) 4.000000 0.000000

C( 2, 3) 5.000000 0.000000

C( 2, 4) 5.000000 0.000000

C( 3, 1) 7.000000 0.000000

C( 3, 2) 6.000000 0.000000

C( 3, 3) 7.000000 0.000000

C( 3, 4) 6.000000 0.000000

C( 4, 1) 7.000000 0.000000

C( 4, 2) 8.000000 0.000000

C( 4, 3) 8.000000 0.000000

C( 4, 4) 6.000000 0.000000

C( 5, 1) 7.000000 0.000000

C( 5, 2) 9.000000 0.000000

C( 5, 3) 8.000000 0.000000

C( 5, 4) 6.000000 0.000000

C( 6, 1) 7.000000 0.000000

C( 6, 2) 10.00000 0.000000

C( 6, 3) 8.000000 0.000000

C( 6, 4) 6.000000 0.000000

X( 1, 1) 0.000000 -4.000000

X( 1, 2) 0.000000 -2.000000

X( 1, 3) 0.000000 -3.000000

X( 1, 4) 1.000000 -4.000000

X( 2, 1) 1.000000 -6.000000

X( 2, 2) 0.000000 -4.000000

X( 2, 3) 0.000000 -5.000000

X( 2, 4) 0.000000 -5.000000

X( 3, 1) 1.000000 -7.000000

X( 3, 2) 0.000000 -6.000000

X( 3, 3) 0.000000 -7.000000

X( 3, 4) 0.000000 -6.000000

X( 4, 1) 0.000000 -7.000000

X( 4, 2) 0.000000 -8.000000

X( 4, 3) 1.000000 -8.000000

X( 4, 4) 0.000000 -6.000000

X( 5, 1) 0.000000 -7.000000

X( 5, 2) 1.000000 -9.000000

X( 5, 3) 0.000000 -8.000000

X( 5, 4) 0.000000 -6.000000

X( 6, 1) 0.000000 -7.000000

X( 6, 2) 1.000000 -10.00000

X( 6, 3) 0.000000 -8.000000

X( 6, 4) 0.000000 -6.000000

Row Slack or Surplus Dual Price

1 44.00000 1.000000

2 1.000000 0.000000

3 1.000000 0.000000

4 0.000000 0.000000

5 0.000000 0.000000

6 0.000000 0.000000

7 0.000000 0.000000

8 0.000000 0.000000

9 0.000000 0.000000

10 0.000000 0.000000

11 0.000000 0.000000