MIS-64018-004 Assign_Module_2 The LP Model

Tammy Liu wliu16@kent.edu Sep 12 Mon

1. Back Savers Production Tradeoff Problem

a. The decision variables are: X_1 as the number of Collegiate backpack produced and X_2 as the number of the Mini backpack produced.
b. The objective function is to maximize the total profit from the backpack production as Max Profit = $32X_1 + 24X_2$
c. There are three constraints as the following:
   - Total nylon available per week: $3X_1 + 2X_2 <= 5,000$
   - Total hours available from all labor per week: $45/60X_1 + 40/60X_2 <=$ 35laborers*40 hours/labor/week
   - Total sold per week: $X_1 <=1,000$, $X_2 <= 1,200$
d. Full mathematical formulation
   Max Profit = $32X_1 + 24X_2$
   Subject to
   $3X_1 + 2X_2 <= 5,000$
   $45/60X_1 + 40/60X_2 <= 35*40$
   $X_1 <=1,000$, $X_2 <= 1,200$

2. The Weigelt Corp. Capacity Allocation Problem

a. Decision variables:
   L_1: number of units of large products produced in Plant 1
   L_2: number of units of large products produced in Plant 2
   L_3: number of units of large products produced in Plant 3
   M_1: number of units of medium products produced in Plant 1
   M_2: number of units of medium products produced in Plant 2
   M_3: number of units of medium products produced in Plant 3
   S_1: number of units of small products produced in Plant 1
   S_2: number of units of small products produced in Plant 2
   S_3: number of units of small products produced in Plant 3

b. LP model:

The objective function is to max profit
Max Z = $420*(L_1+L_2+L_3) +360*(M_1+M_2+M_3) +300*(S_1+S_2+S_3)$

Subject to:
Capacity constraint:

$L_1+M_1+S_1<= 750$
$L_2+M_2+S_2<= 900$

$L_3+M_3+S_3<= 450$

Storage constraint:

$20*L_1+15*M_1+12*S_1 <=13,000$

$20*L_2+15*M_2+12*S_2 <=12,000$

$20*L_3+15*M_3+12*S_3 <=5,000$

Sale constraint:

$L_1+L_2+L_3 >=900$

$M_1+M_2+M_3 >=1,200$

$S_1+S_2+S_3>=750$

Same percentage in excess capacity production:

$(L_1+M_1+S_1):(L_2+M_2+S_2):(L_3+M_3+S_3)= 750:900:450$

Non-negativity:

$L_1, L_2, L_3, M_1, M_2, M_3, S_1, S_2, S_3 >=0$