

Assignment 2

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2022-09-20

Linear Programming Problems

The objective function is $Max \quad z = 420(L_1 + M_1 + s_1) + 360(L_2 + M_2 + s_2) + 300(L_3 + M_3 + s_3)$

Subject to

$$L_1 + M_1 + s_1 \leq 750$$

$$L_2 + M_2 + s_2 \leq 900$$

$$L_3 + M_3 + s_3 \leq 450$$

$$20L_1 + 15M_1 + 12s_1 \leq 1300$$

$$20L_2 + 15M_2 + 12s_2 \leq 12000$$

$$20L_3 + 15M_3 + 12s_3 \leq 5000$$

$$L_1 + L_2 + L_3 \leq 900$$

$$M_1 + M_2 + M_3 \leq 1200$$

$$s_1 + s_2 + s_3 \leq 750$$

Non Negative Constraints $L_1, L_2, L_3, M_1, M_2, M_3, s_1, s_2, s_3 \geq 0$

The above LP problem constraints can be written as

$$L_1 + M_1 + s_1 + 0L_2 + 0M_2 + 0s_2 + 0L_3 + 0M_3 + 0s_3 \leq 750$$

$$0L_1 + 0M_1 + 0s_1 + L_2 + M_2 + s_2 + 0L_3 + 0M_3 + 0s_3 \leq 900$$

$$0L_1 + 0M_1 + 0s_1 + 0L_2 + 0M_2 + 0s_2 + L_3 + M_3 + s_3 \leq 450$$

$$20L_1 + 15M_1 + 12s_1 + 0L_2 + 0M_2 + 0s_2 + 0L_3 + 0M_3 + 0s_3 \leq 13000$$

$$0L_1 + 0M_1 + 0s_1 + 20L_2 + 15M_2 + 12s_2 + 0L_3 + 0M_3 + 0s_3 \leq 12000$$

$$0L_1 + 0M_1 + 0s_1 + 0L_2 + 0M_2 + 0s_2 + 20L_3 + 15M_3 + 12s_3 \leq 5000$$

$$L_1 + 0M_1 + 0s_1 + L_2 + 0M_2 + 0s_2 + L_3 + 0M_3 + 0s_3 \leq 900$$

$$0L_1 + M_1 + 0s_1 + 0L_2 + M_2 + 0s_2 + 0L_3 + M_3 + 0s_3 \leq 1200$$

$$0L_1 + 0M_1 + s_1 + 0L_2 + 0M_2 + s_2 + 0L_3 + 0M_3 + s_3 \leq 750$$

```

library("lpSolve")
#Objective Function
f.obj<-c(420,360,300,420,360,300,420,360,300)
#Constraints
f.con<-matrix(c(1,1,1,0,0,0,0,0,0,
               0,0,0,1,1,1,0,0,0,
               0,0,0,0,0,0,1,1,1,
               20,15,12,0,0,0,0,0,0,
               0,0,0,20,15,12,0,0,0,
               0,0,0,0,0,0,20,15,12,
               1,0,0,1,0,0,1,0,0,
               0,1,0,0,1,0,0,1,0,
               0,0,1,0,0,1,0,0,1),nrow=9,byrow=TRUE)
#Set inequality signs
f.dir<-c("<=",
        "<=",
        "<=",
        "<=",
        "<=",
        "<=",
        "<=",
        "<=",
        "<=")
#Set right hand side coefficients
f.rhs<-c(750,900,450,13000,12000,5000,900,1200,750)
#Value of Z
lp("max",f.obj,f.con,f.dir,f.rhs)

```

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## Success: the objective function is 708000
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lp("max",f.obj,f.con,f.dir,f.rhs)$solution
```

```
## [1] 350.0000 400.0000  0.0000  0.0000 400.0000 500.0000  0.0000 133.3333
## [9] 250.0000
```