QMM ASSIGNMENT 2

ABHINAY CHIRANJEETH MARNENI

2022-09-23

Formulate a Linear Programming Problem

Objective Function $Max\ \ (Z) = 420(P_1L + P_2L + P_3L) + 360(P_1M + P_2M + P_3M) + 300(P_1S + P_2S + P_3S)$

subject to

$$P_1L + P_1M + P_1S \leq 750$$
$$P_2L + P_2M + P_2S \leq 900$$
$$P_3L + P_3M + P_3S \leq 450$$

$$20P_1L + 15P_1M + 12P_1S \leq 13000$$
$$20P_2L + 15P_2M + 12P_2S \leq 12000$$
$$20P_3L + 15P_3M + 12P_3S \leq 5000$$

$$P_1L + P_2L + P_3L \leq 900$$
$$P_1M + P_2M + P_3M \leq 1200$$
$$P_1S + P_2S + P_3S \leq 750$$

Non- Negativity constraints:

$$P_1L, P_2L, P_3L, P_1M, P_2M, P_3M, P_1S, P_2S, P_3S \geq 0$$

The Constraints for LP Problem can be written as:

capacity excess limit:

$$P_1L + P_1M + P_1S + 0P_2L + 0P_2M + 0P_2S + 0P_3L + 0P_3M + 0P_3S \leq 750$$
$$0P_1L + 0P_1M + 0P_1S + P_2L + P_2M + P_2S + 0P_3L + 0P_3M + 0P_3S \leq 900$$
$$0P_1L + 0P_1M + 0P_1S + 0P_2L + 0P_2M + 0P_2S + P_3L + P_3M + P_3S \leq 450$$

material constraints:

$$20P_1L + 15P_1M + 12P_1S + 0P_2L + 0P_2M + 0P_2S + 0P_3L + 0P_3M + 0P_3S \leq 13000$$

$$0P_1L + 0P_1M + 0P_1S + 20P_2L + 15P_2M + 12P_2S + 0P_3L + 0P_3M + 0P_3S \leq 12000$$
$$0P_1L + 0P_1M + 0P_1S + 0P_2L + 0P_2M + 0P_2S + 20P_3L + 15P_3M + 12P_3S \leq 5000$$

sales forecast constraints:

$$P_1L + P_1M + 0P_1S + P_2L + 0P_2M + 0P_2S + P_3L + 0P_3M + 0P_3S \leq 900$$
$$0P_1L + P_1M + 0P_1S + 0P_2L + P_2M + 0P_2S + 0P_3L + P_3M + 0P_3S \leq 1200$$
$$0P_1L + 0P_1M + P_1S + 0P_2L + 0P_2M + P_2S + 0P_3L + 0P_3M + P_3S \leq 750$$

```
library(lpSolve)

f.obj <-c(420,360,300,420,360,300,420,360,300)   #Objective Function



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) #constraints

f.dir <- c("<=",
           "<=",
           "<=",
           "<=",
           "<=",
           "<=",
           "<=",
           "<=",
           "<=" )   #Set of inequality constraints


f.rhs <-c(750,900,450,13000,12000,5000,900,1200,750) # right hand side coefficients


lp("max",f.obj,f.con,f.dir,f.rhs) #Final objective value of z
```

```
## Success: the objective function is 708000
```

```
lp("max",f.obj,f.con,f.dir,f.rhs)$solution  # Final variables
```

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