Qmm Assignment-5

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Loading the packages

```
library(lpSolve)
library(lpSolveAPI)
```

The objective function is Z = P-6C-3D

Where, P = total profit over the life of the new products

##C = change in the current level of employment ##D = decrease in next year's earnings from the current year's level.

Where, xc1,xc2,xc3,yc1,yc2,yc3,yc4

Let xc1 ,xc2 and xc3 be the number of products produced for Product 1,2 and 3

yc1 = negative deviation or per unit decrease in employment level

yc2 = Positive deviation or per unit increase in employment level

yc3 = negative deviation or per unit decrease in goal regarding earnings next year

yc4 = Positive deviation or per unit increase in goal regarding earnings next year

Maximize profit which is given by

P = 20xc1 + 15xc2 +25xc3

while maintaining employment level as 50 employees and increasing next year earnings above 75 million dollars

Formulation of constraints

yc2 - yc1 = 6x1 + 4x2 + 5x3 - 50 #Employment level constraint

yc4 - yc3 = 8x1 + 7x2 + 5x3 - 75 #Earnings next year constraint

Objective function is:

Maximize(Z): 20xc1 + 15xc2 + 25xc3 - 6yc1 - 6yc2- 3yc3

Constraints:

6xc1 + 4xc2 + 5xc3 + yc1 - yc2 = 50

8xc1 + 7xc2 + 5xc3 + yc3 - yc4 = 75

importing the "gp.lp" file data which show above

```
goal<- read.lp("gp.lp")
goal
```

```
## Model name:
##            xc1   xc2   xc3   yc1   yc2   yc3   yc4
## Maximize    20    15    25    -6    -6    -3     0
## R1           6     4     5     1    -1     0     0  =  50
## R2           8     7     5     0     0     1    -1  =  75
## Kind       Std   Std   Std   Std   Std   Std   Std
## Type      Real  Real  Real  Real  Real  Real  Real
## Upper      Inf   Inf   Inf   Inf   Inf   Inf   Inf
## Lower        0     0     0     0     0     0     0
```

Table

```
goal1<- matrix(c("Total Profit", "Employment Level", "Earnings Next Year",
                 20,6,8,
                 15,4,7,
                 25,5,5,
                 "Maximize","=50",">=75"),ncol=5, byrow = F)

colnames(goal1) <- c('Factor', 'Product1','Product2','Product3','Goal')
goal1
```

```
##      Factor               Product1 Product2 Product3 Goal
## [1,] "Total Profit"       "20"     "15"     "25"     "Maximize"
## [2,] "Employment Level"   "6"      "4"      "5"      "=50"
## [3,] "Earnings Next Year" "8"      "7"      "5"      ">=75"
```

Finding to get objective and variables values from above goal data file.

Solving

```
solve(goal)
```

```
## [1] 0
```

```
get.objective(goal)
```

```
## [1] 225
```

```
get.variables(goal)
```

```
## [1]  0  0 15  0 25  0  0
```

Interpretation

225 million dollars are the profit, which is showing the problem's objective function.

The constraint values are: xc1=0,xc2=0,xc3=15,yc1=0,yc2=25,yc3=0,yc4=0

We can see from the above values of the constraints that xc1=0 and xc2=0, which means that expanding the number of units produced for Products 1 and 2 will not greatly impact total profit maximization,

We can see expanding the number of units produced for Products 3 by xc3=15 can help in contributing to profit maximization.

The employment level was to maintain as 50. Here, yc2=25 shows a positive departure, which converts into a rise in employment of 250 individuals. This will lead to a decrease in profit.

The estimated values of yc3 and yc4 can be utilized to calculate the earnings for the next year. Here, both values are zero, showing neither the profits for the next year might rise or fall.