Goal Programming

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Given Equation

```
library(lpSolveAPI)

gp_table <- matrix(c("Total Profit", "Employment Level", "Earnings Next Year",
20,6,8,
15,4,7,
25,5,5,
"Maximize","=50",">=75", "Millions of Dollars", "Hundreds of Employees", "Millions of Dollars"), ncol=6)
colnames(gp_table) <- c("Factor","Product 1", "Product 2", "Product 3", "Goal", "Units")
print(gp_table)
```

```
##      Factor               Product 1 Product 2 Product 3 Goal
## [1,] "Total Profit"       "20"      "15"      "25"      "Maximize"
## [2,] "Employment Level"   "6"       "4"       "5"       "=50"
## [3,] "Earnings Next Year" "8"       "7"       "5"       ">=75"
##      Units
## [1,] "Millions of Dollars"
## [2,] "Hundreds of Employees"
## [3,] "Millions of Dollars"
```

Formulating Goal programming equation

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

```
## Model name:
##             x1    x2    x3   y1p   y1m   y2m   y2p
## 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
```

Solving GP

```
solve(gp)
```

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

```
get.objective(gp)
```

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

```
get.variables(gp)
```

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

1. **Interpretation:** After applying simplex method we get x1=0, x2=0, x3=15 , y1p=25, y1m=0, y2m=0, y2p=0
2. From the above we can interpret that product 3 can be optimized by increasing 15 units which maximizes profit.
3. since y2m=0, the goal for earnings has been achieved. But the employment goal has been exceeded by 25(2500 employees) in order to maximize the objective function.
4. The maximized objective of the company is 225