

# Module 9 - Goal Programming

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Emax Corporation wishes to Maximize  $Z=P-6C-3D$ ; where  $P$ =total profit of new products,  $C$ =change of employment, and  $D$ =decrease in next year's earnings

Define terms for the problem

$y1p$  is positive change of employment level from 50 and  $y1m$  is negative change of employment level from 50

$y2p$  is positive change in next year's earnings and  $y2m$  is negative change in next year's earnings

$x1$  = production of product 1

$x2$  = production of product 2

$x3$  = production of product 3

Algebraic expression of terms for the problem

$$6x1 + 4x2 + 5x3 - (y1p - y1m) = 50$$

$$8x1 + 7x2 + 5x3 - (y2p - y2m) = 75$$

$$P = 20x1 + 15x2 + 25x3$$

Management's Objective Function

$$\text{Maximize } 20x1 + 15x2 + 25x3 - 6 y1p - 6 y1m - 3 y2m$$

LP Model for Emax Corp

/\* Objective function \*/

$$\text{max: } 20x1 + 15x2 + 25x3 - 6 y1p - 6 y1m - 3 y2m;$$

// Constraints

$$6x1 + 4x2 + 5x3 + y1m - y1p = 50;$$

$$8x1 + 7x2 + 5x3 + y2m - y2p = 75;$$

Load lp library and load lp file for Emax Corp

```
library(lpSolveAPI)
goal <- read.lp("goal_programming_assignment.lp")
```

## Emax linear model

```
goal
```

```
## 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
```

## Solve Emax Corp linear model

```
solve(goal)
```

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

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

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

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

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

## Emax Recommendation

Emax should produce 15 units of product 3 for an objective function score of 225. This creates an employment level of 75, which is 25 over the constraint of 50.