

# Assignment 2

2022-09-23

```
###installing package  
library("lpSolve")  
library(lpSolveAPI)
```

```
### creating lp with 0 constraints and 9 decision variables  
lprec <-make.lp(0,9)  
lprec
```

```
## Model name:  
##   a linear program with 9 decision variables and 0 constraints
```

```
### Using Max function to maximize the profit  
set.objfn(lprec, c(420,360,300,420,360,300,420,360,300))  
lp.control(lprec,sense="max")
```

```

## $anti.degen
## [1] "none"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
##
## $bb.rule
## [1] "pseudononint" "greedy"          "dynamic"          "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
## $break.at.value
## [1] 1e+30
##
## $epsilon
##      epsb      epsd      epsel      epsint  epsperturb  epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
##      1e-11      1e-11
##
## $negrange
## [1] -1e+06
##
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"      "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5

```

```
##  
## $scaling  
## [1] "geometric" "equilibrate" "integers"  
##  
## $sense  
## [1] "maximize"  
##  
## $simplextype  
## [1] "dual" "primal"  
##  
## $timeout  
## [1] 0  
##  
## $verbose  
## [1] "neutral"
```

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### Using Max function to maximize the profit  
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```
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##
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##
## $timeout
## [1] 0
##
## $verbose
## [1] "neutral"
```

### ### Adding constraints

#### *#Production Capacity Constraints*

```
add.constraint(lprec,c(1, 1, 1, 0, 0, 0, 0, 0, 0), "<=",750)
add.constraint(lprec,c(0, 0, 0, 1, 1, 1, 0, 0, 0), "<=",900)
add.constraint(lprec,c(0, 0, 0, 0, 0, 0, 1, 1, 1), "<=",450)
```

#### ###Storage Capacity constraints

```
add.constraint(lprec,c(20, 15, 12, 0, 0, 0, 0, 0, 0), "<=",13000)
add.constraint(lprec,c(0, 0, 0, 20, 15, 12, 0, 0, 0), "<=",12000)
add.constraint(lprec,c(0, 0, 0, 0, 0, 0, 20, 15, 12), "<=",5000)
```

#### ###Sales Forecast constraints

```
add.constraint(lprec,c(1, 1, 1, 0, 0, 0, 0, 0, 0), "<=",900)
add.constraint(lprec,c(0, 0, 0, 1, 1, 1, 0, 0, 0), "<=",1200)
add.constraint(lprec,c(0, 0, 0, 0, 0, 0, 1, 1, 1), "<=",750)
```

#### *#Plants Excess capacity constraints*

```
add.constraint(lprec, c(900, 0, 0, 900, 0, 0, 900, 0, 0) - c(0, 750, 0, 0, 750, 0, 0, 750, 0),
"=", 0)

add.constraint(lprec, c(0, 450, 0, 0, 450, 0, 0, 450, 0) - c(0, 0, 900, 0, 0, 900, 0, 0, 900),
"=", 0)

add.constraint(lprec, c(450, 0, 0, 450, 0, 0, 450, 0, 0) - c(0, 0, 750, 0, 0, 750, 0, 0, 750),
"=", 0)
```

```
RowNames <- c("Production 1 ", "Production 2 ", "Production 3", "Storage p1", "storage p2", "storage  
p3", "Sales 1", "ales 2", "Sales 3", "Excess capacity 1", "Excess capacity 2", "Excess capacity 3")  
ColNames <- c("L1", "L2", "L3", "M1", "M2", "M3", "S1", "S2", "S3")  
dimnames(lprec) <- list(RowNames, ColNames)
```

```
### Objective Function
```

```
solve(lprec)
```

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

```
get.objective(lprec)
```

```
## [1] 684955.8
```

## The objective function is 684955.8 \$

```
### Get Variables
```

```
get.variables(lprec)
```

```
## [1] 500.000000 0.000000 250.000000 2.654867 796.460177 0.000000 161.061947  
## [8] 0.000000 148.230088
```

In order to reach the max profit of 684955.8 \$ we have to produce the following :

Plant 1 : 500.000000 of large products , 2.654867 of Medium Products , and 161.061947 of Small Products

Plant 2 : 250.000000 of large products , and 796.460177 of Medium Products

Plant 3 : 148.230088 of Small products