QMM Assignment\_1

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**Problem 1:**

Total Nylon sheet in square-foot - 5000

Total working time in minutes - 84000

A. Decision Variables- Collegiate(A) & Mini(B)

B. Objective function for profit maximization (C) = 32A+24B

C. Constraints- A>=1000 B>=1200

D. Mathematical formulation- 3A+2B<=5000 45A+40B<=84000 A, B>=0

**Problem 2:**

install.packages("lpSolveAPI")

Now, load the library

library(lpSolveAPI)

## Warning: package 'lpSolveAPI' was built under R version 4.1.3

## Let’s construct the WGC issue. Notably, there were three constraints and two decision variables.

##In the first formulation, the objective function and constraints would be constructed immediately.

# make an lp object with 0 constraints and 9 decision variables  
lprec <- make.lp(nrow=0, ncol=9)  
set.objfn(lprec, c(420, 360, 300, 420, 360, 300, 420, 360, 300))  
lp.control(lprec,sense='max')

## $anti.degen  
## [1] "fixedvars" "stalling"   
##   
## $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"

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)  
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)  
add.constraint(lprec, c(1,0,0,1,0,0,1, 0, 0), "<=", 900)  
add.constraint(lprec, c(0,1,0,0,1,0,0, 1, 0), "<=", 1200)  
add.constraint(lprec, c(0,0,1,0,0,1,0, 0, 1), "<=", 750)  
set.bounds(lprec, lower = c(0, 0), columns = c(1, 9)) #Not really needed  
RowNames <- c("Cap1", "cap2", "cap3", "space1","space2","space3", "sale1","sale2","sale3")  
ColNames <- c("L1", "M1","S1","L2", "M2","S2","L3", "M3","S3")  
dimnames(lprec) <- list(RowNames, ColNames)  
# Now, print out the model  
lprec

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

write.lp(lprec,filename = "Assignment\_2",type = "lp")  
solve(lprec)

## [1] 0

get.objective(lprec)

## [1] 708000

get.variables(lprec)

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

##We now solve the above LP problem

solve(lprec)

## [1] 0

##The output above doesn’t indicate that the answer is 0, but that there was a successful solution. ##We now output the value of the objective function, and the variables.

get.objective(lprec)

## [1] 708000

get.variables(lprec)

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

get.constraints(lprec)

## [1] 750.0000 900.0000 383.3333 13000.0000 12000.0000 5000.0000 350.0000  
## [8] 933.3333 750.0000