Mderangu LP-4

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##Lets start by installing the lpSolve package.  
##install.packages("lpSolve")  
  
library(lpSolve)  
  
# Define the objective function coefficients  
# Order: S1, S2, S3, M1, M2, M3, L1, L2, L3  
f.obj <- c(300, 300, 300, 360, 360, 360, 420, 420, 420)  
  
# Define the constraint matrix  
#In total, this sums up to 12 constraints:  
  
# 3 production capacity constraints  
# 3 storage space constraints  
# 3 sales forecast constraints  
# 3 utilization constraints  
  
f.con <- matrix(c(  
 # Production capacity constraints: Each plant has a maximum production capacity for the three products.  
 1, 0, 0, 1, 0, 0, 1, 0, 0, # Plant 1  
 0, 1, 0, 0, 1, 0, 0, 1, 0, # Plant 2  
 0, 0, 1, 0, 0, 1, 0, 0, 1, # Plant 3  
   
 # Storage space constraints: Each plant has constraints on storage space for the products.  
 12, 0, 0, 15, 0, 0, 20, 0, 0, # Plant 1  
 0, 12, 0, 0, 15, 0, 0, 20, 0, # Plant 2  
 0, 0, 12, 0, 0, 15, 0, 0, 20, # Plant 3  
   
 # Sales forecast constraints: Limits are placed based on projected sales for each product category.  
 1, 1, 1, 0, 0, 0, 0, 0, 0, # Large  
 0, 0, 0, 1, 1, 1, 0, 0, 0, # Medium  
 0, 0, 0, 0, 0, 0, 1, 1, 1, # Small  
   
 # Percentage utilization constraints (p is the same for all plants)  
 900, -750, 0, 900, -750, 0, 900, -750, 0, # Plant 1 utilization  
 0, 450, -900, 0, 450, -900, 0, 450, -900, # Plant 2 utilization  
 -450, 0, 750, -450, 0, 750, -450, 0, 750 # Plant 3 utilization  
), ncol = 9, byrow = TRUE)  
  
# Define the direction of the inequalities  
f.dir <- c('<=', '<=', '<=', '<=', '<=', '<=', '<=', '<=', '<=',  
 '=', '=', '=')  
  
# Define the right-hand side of the constraints  
f.rhs <- c(  
 750, # Plant 1 production capacity  
 900, # Plant 2 production capacity  
 450, # Plant 3 production capacity  
 13000, # Plant 1 storage space  
 12000, # Plant 2 storage space  
 5000, # Plant 3 storage space  
 750, # Sales limit for large size  
 1200, # Sales limit for medium size  
 900, # Sales limit for small size  
 0, # Percentage utilization for Plant 1 (dummy for p)  
 0, # Percentage utilization for Plant 2 (dummy for p)  
 0 # Percentage utilization for Plant 3 (dummy for p)  
)  
  
lp("max", f.obj, f.con, f.dir, f.rhs)

## Success: the objective function is 696000

# Solve the linear programming problem  
result <- lp("max", f.obj, f.con, f.dir, f.rhs)  
  
# Access the solution  
solution <- result$solution  
print(solution)

## [1] 0.0000 166.6667 416.6667 177.7778 666.6667 0.0000 516.6667 0.0000  
## [9] 0.0000