QMM Assignment 2

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## R Markdown

tbl <- matrix(c(22,14,30,600,100 ,  
16,20,24,625,120,  
80,60,70,"-","-" ), ncol=5, byrow=TRUE)  
colnames(tbl) <- c("Warehouse 1", "Warehouse 2", "Warehouse 3","Production cost","Production Capacity")  
rownames(tbl) <- c("Plant A", "Plant B","Monthly Demand")  
tbl <- as.table(tbl)  
tbl

## Warehouse 1 Warehouse 2 Warehouse 3 Production cost  
## Plant A 22 14 30 600   
## Plant B 16 20 24 625   
## Monthly Demand 80 60 70 -   
## Production Capacity  
## Plant A 100   
## Plant B 120   
## Monthly Demand -

LP format of transporation problem are

$$ \text{Min} \hspace{.2cm} TC = 22 x\_{11} +14 x\_{12} +30 x\_{13}$$

The Supply constraints are :

$$\text The Demand Constraints are :$$

library(lpSolve)  
  
# Set up cost matrix  
  
cost\_tbl <- matrix(c(622,614,630,0,  
641,645,649,0), ncol = 4,byrow = TRUE)  
  
# Set Plant names  
  
colnames(cost\_tbl ) <- c("Warehouse 1", "Warehouse 2","Warehouse 3","Dummy")  
rownames(cost\_tbl ) <- c("Plant A", "Plant B")  
cost\_tbl

## Warehouse 1 Warehouse 2 Warehouse 3 Dummy  
## Plant A 622 614 630 0  
## Plant B 641 645 649 0

#Set up constraint signs and right-hand sides (supply side)

row.signs <- rep("<=", 2)  
row.rhs <- c(100,120)

#Demand (sinks) side constraints

col.signs <- rep(">=", 4)  
col.rhs <- c(80,60,70,10)

#Running the

lptrans\_tbl <- lp.transport(cost\_tbl, "min", row.signs, row.rhs, col.signs, col.rhs)

#Values of all 8 variables

lptrans\_tbl$solution

## [,1] [,2] [,3] [,4]  
## [1,] 0 60 40 0  
## [2,] 80 0 30 10

#Value of the objective function

lptrans\_tbl$objval

## [1] 132790

#Getting the constraints value

lptrans\_tbl$solution

## [,1] [,2] [,3] [,4]  
## [1,] 0 60 40 0  
## [2,] 80 0 30 10

1. Dual Problem:

Formulating the dual constraints and variables

$$
\text{The objective function is }Max\hspace{.3cm} VA= 80w\_{1}+60w\_{2}+70w\_{3}-100p\_{1}-120p\_{2}
$$

$$
\text{Where,}\hspace{.3cm}w\_{1}\text{= Price received at the Warehouse 1}
$$

Subject to:

3) Economic Interpretation of dual:

The goal of AED’s business is to reduce the total cost of production and shipment.

To achieve this, the corporation needs hire a logistic company to handle the transportation, which will include purchasing the AEDs and transporting them to various warehouses in an effort to reduce the overall cost of production and shipping.

$$ \text{From the above we get to see that}\hspace{.3cm} w\_{1}−p\_{1}\ge 622$$

$$ \text{That can be exponented as}\hspace{.3cm} w\_{1} \ge 622+p\_{1}$$

$$ \text{Here}\hspace{.3cm} w\_{1}\hspace{.3cm}\text{is considered as the price payments being received at the origin which is nothing else,but the revenue,whereas}\hspace{.3cm} p\_{1}+622\hspace{.3cm}\text{is the money paid at the origin at PlantA}
$$

$$\text{This can be formulated as below}\\
MR \ge MC
$$