LINEAR PROGRAMMING MODEL

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LINEAR PROGRAMMING MODEL:

☐ Objective Function:

Our goal is to maximize (Smax) the overall profit:

$Smax = 420pA1+420pA2+420pA3+360pB1+ 360pB2+ 360pB3+ 300pC1+ 300pC2+300pC3$ respectively.

☐ Constraints: EXCESS CAPACITY: Excess capacity for Plant 1: $pA1 + pB1 + pC1 <= 750$ Excess capacity for Plant 2: $pA2 + pB2 + pC2 <= 900$ Excess capacity for Plant 3: $pA3 + pB3 + pC3 <= 450$

RESTRICTION ON SALE PREDICTIONS: Large sales prediction: $pA1 + pB2 + pC3 < = 900$ Medium sales prediction: $pA1 + pB2 + pC3 <= 1200$ Small sales prediction: $pA1 + pB2 + pC3 <= 750$

STORAGE VOLUME: Storage volume in plant 1: $20pA1+15pB1+12pC1 <= 13000$ Storage area in plant 2: $20pA2 + 15pB2 + 12pC2 <= 12000$. Storage space in plant 3: $20pA3 + 15pB3 + 12pC3 <= 5000$.

Given that each plant should consume an equal percentage of its production unit. $900(pA1+ pB1+ pC1) – 750(pA2+ pB2+ pC2) = 0$ $450(pA2+ pB2+ pC2) – 900(pA3+ pB3+ pC3) = 0$ $450(pA1+pB1+pC1) – 750 (pA3+pB3+pC3)=0$

NON-NEGATIVITY: $pA1, pA2, pA3, pB1, pB2, pB3, pC1, pC2, pC3 >= 0$:(non-Negativity)

```r
#installed the library lpsolve and call it, to run the code
library(lpSolve)

#defining the objective function:
objective=c(420,360,300,
            420,360,300,
            420,360,300)

#the constraints:
constraints=matrix(c(1,1,1,0,0,0,0,0,0,
                     0,0,0,1,1,1,0,0,0,
                     0,0,0,0,0,0,1,1,1,
                     1,0,0,1,0,0,1,0,0,
                     0,1,0,0,1,0,0,1,0,
                     0,0,1,0,0,1,0,0,1,
                     20,15,12,0,0,0,0,0,0,
                     0,0,0,20,15,12,0,0,0,
                     0,0,0,0,0,0,20,15,12),nrow =9,byrow = TRUE)

#defining the directions of inequality constraints
directions=c("<=",
             "<=",
             "<=",
             "<=",
             "<=",
             "<=",
             "<=",
             "<=",
             "<=")

#setting up the right hand side values
values=c(750,
         900,
         450,
         900,
         1200,
         750,
         13000,
         12000,
         5000)

#the value of S
lp("max",objective,constraints,directions,values)
```

```
## Success: the objective function is 708000
```

```r
#final solution
lp("max",objective,constraints,directions,values)$solution
```

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