Quantitative Assignment 1

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1. Here we are importing Covid Data for India and displaying summary stats and plottingit on a graph.

Import Covid Data

```
library(readr)
Covid_Data <-  read_csv("Latest Covid-19 India Status.csv",
    col_types = cols(`Total Cases` = col_number(),
        Active = col_number(), Discharged = col_number(),
        Deaths = col_number(), `Active Ratio (%)` = col_number(),
        `Discharge Ratio (%)` = col_number(),
        `Death Ratio (%)` = col_number()))

View(Covid_Data)
```

Summarizing the data

```
summary(Covid_Data)
```

```
##    State/UTs           Total Cases          Active           Discharged
##  Length:36          Min.   :   7572   Min.   :     2.0   Min.   :   7437
##  Class :character   1st Qu.:  74282   1st Qu.:   145.5   1st Qu.:  71352
##  Mode  :character   Median : 470296   Median :   701.5   Median : 461604
##                     Mean   : 918301   Mean   : 10912.9   Mean   : 895137
##                     3rd Qu.:1006543   3rd Qu.:  5709.2   3rd Qu.: 992515
##                     Max.   :6489800   Max.   :239338.0   Max.   :6300755
##      Deaths         Active Ratio (%)  Discharge Ratio (%) Death Ratio (%)
##  Min.   :     4.0   Min.   : 0.0100   Min.   :82.28       Min.   :0.040
##  1st Qu.:   811.2   1st Qu.: 0.0475   1st Qu.:97.62       1st Qu.:0.955
##  Median :  5421.5   Median : 0.5300   Median :98.24       Median :1.300
##  Mean   : 12251.2   Mean   : 1.2511   Mean   :97.48       Mean   :1.266
##  3rd Qu.: 13649.0   3rd Qu.: 0.8300   3rd Qu.:98.65       3rd Qu.:1.590
##  Max.   :137811.0   Max.   :17.3700   Max.   :99.94       Max.   :2.740
```

Graphical Representation of data

```
plot(Covid_Data)
```
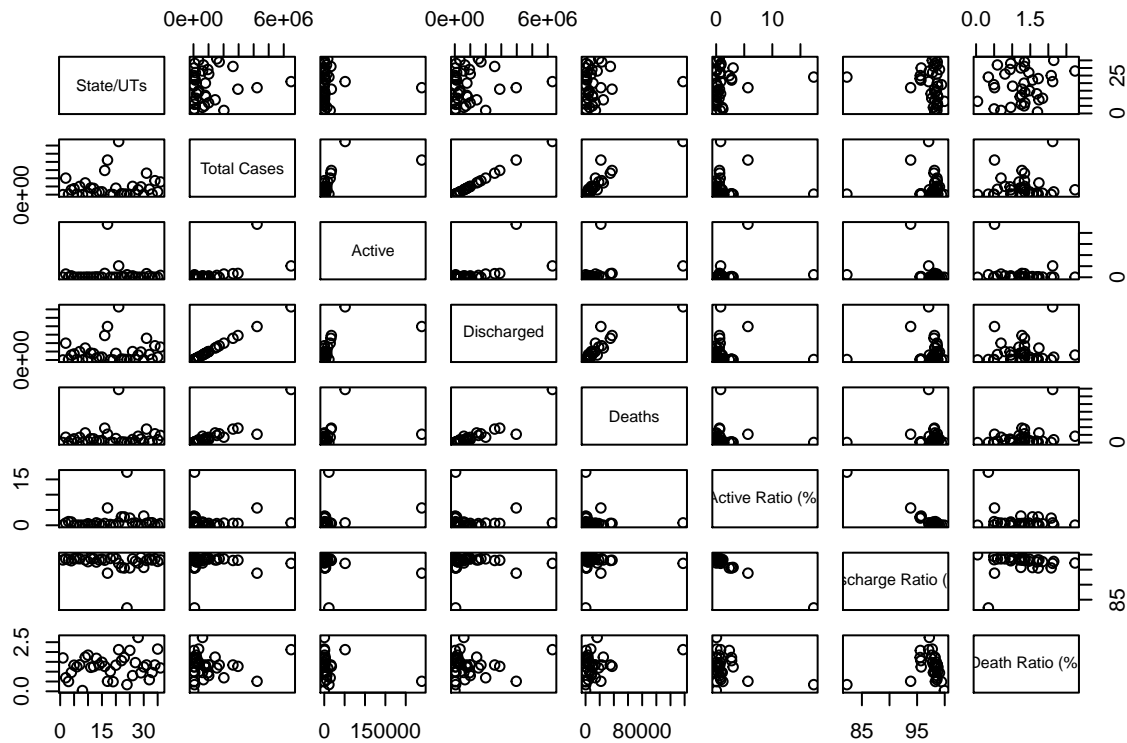

2. Back Savers is a company that produces backpacks primarily for students. They are considering offering some combination of two different models—the Collegiate and the Mini. Both are made out of the same rip-resistant nylon fabric. Back Savers has a long- term contract with a supplier of the nylon and receives a 5000 square-foot shipment of the material each week. Each Collegiate requires 3 square feet while each Mini requires 2 square feet. The sales forecasts indicate that at most 1000 Collegiates and 1200 Minis can be sold per week. Each Collegiate requires 45 minutes of labor to produce and generates a unit profit of $32. Each Mini requires 40 minutes of labor and generates a unit profit of $24. Back Savers has 35 laborers that each provides 40 hours of labor per week. Management wishes to know what quantity of each type of backpack to produce per Week.

a. Clearly define the decision variables

```
 The decision variables are X ( for Collegiate bags) and Y (for mini bags)
```

b. What is the objective function?

The objective function is to maximize the profit Z which is

Z = 32X + 24 Y

c. What are the constraints?

The production of collegiate and mini is constrained by the material required to produce each product. Since collegiate requires only 3 sq ft and mini requires only 2 sq ft of high quality nylon, out of the total 5000, the equation for the same is:

```
3X + 2Y <= 5000
```

In addition to this, collegiate generates $32 profit and mini generates $24, this can be described as :

```
Z = 32X + 24Y    ( Which is same as objective function)
```

Also collegiate requires 45 minutes of labour and mini requires 40 min. So this can be described as:

```
45X + 40Y <= 84000 minutes
```

Finally, we can sell upto 1000 collegiate and 1200 mini's per week, so

```
 X <= 1000
Y <= 1200
```

And X, Y $>= 0$.

d. Write down the full mathematical formulation for this LP problem.

```
Z = 32X = 24Y

3X + 2Y <= 5000

45X + 40Y <= 84000

X <= 1000
Y <= 1200
```