Roll_06_Second_Assignment

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Group B

Q no 9)

```
# loading the package "stats"
library(stats)
```

a)

```
# Createing a distance matrix from the given data using the matrix() function,
# Here we are creating 10 rows and then filling the matrix row by row.
city_distances <- matrix(c(
  0, 587, 1212, 701, 1936, 604, 748, 2139, 2182, 543,
  587, 0, 920, 940, 1745, 1188, 713, 1858, 1737, 597,
  1212, 920, 0, 879, 831, 1726, 1611, 1949, 2204, 1494,
  701, 940, 879, 0, 1374, 968, 1420, 1645, 1891, 1220,
  1936, 1745, 831, 1374, 0, 2339, 2451, 347, 2734, 2300,
  604, 1188, 1726, 968, 2339, 0, 1092, 2594, 2408, 923,
  748, 713, 1611, 1420, 2451, 1092, 0, 2571, 678, 205,
  2139, 1858, 1949, 1645, 347, 2594, 2571, 0, 678, 2442,
  2182, 1737, 2204, 1891, 2734, 2408, 678, 678, 0, 2329,
  543, 597, 1494, 1220, 2300, 923, 205, 2442, 2329, 0
), nrow = 10, byrow = TRUE)

# Assigning names to row and columns
city_names <- c("Atlanta", "Chicago", "Denver", "Houston", "Los Angeles", "Miami",
                "New York", "San Francisco", "Seattle", "Washington D.C.")
rownames(city_distances) <- city_names
colnames(city_distances) <- city_names

# Convert to a dissimilarity object
city.dissimilarity <- as.dist(city_distances)
```

b)

```r
# Fit the classical MDS model using city.dissimilarity object
mds_model <- cmdscale(city.dissimilarity, eig = TRUE, k = 2)
```

c)

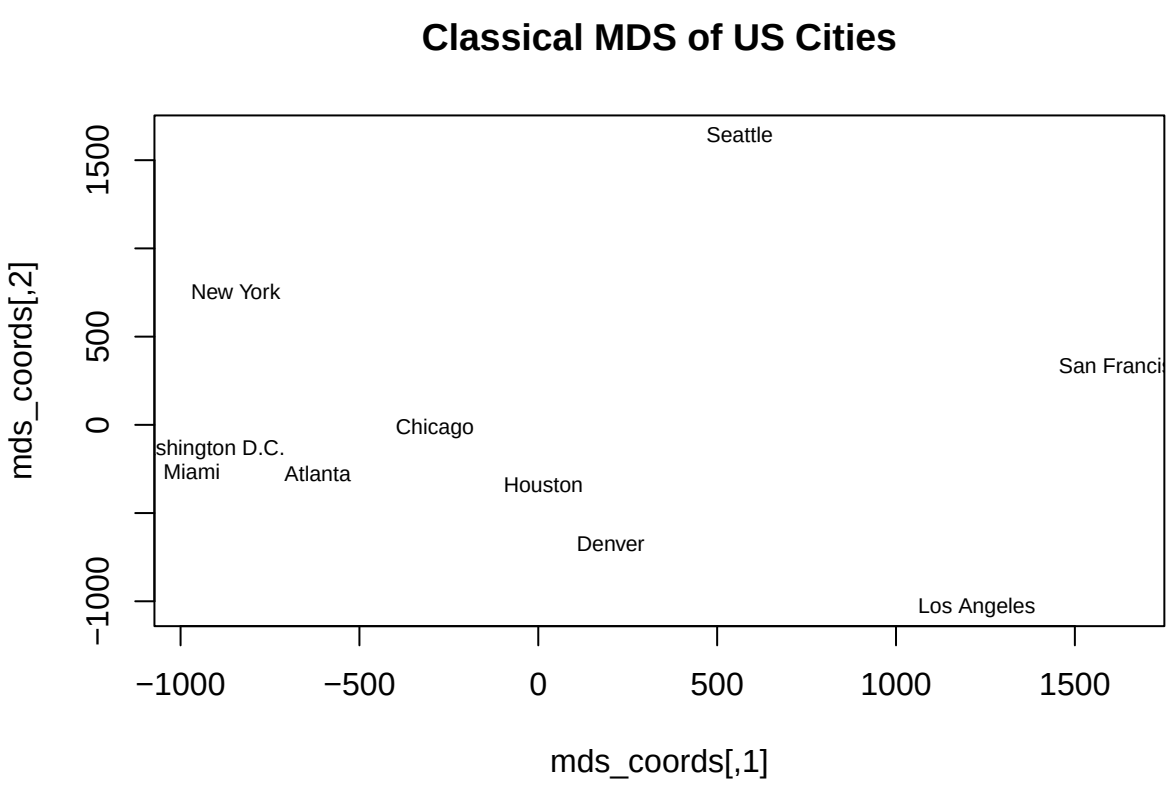
```r
# Summarizing the model

# Here we get the coordinates that represent the positions of the cities.
mds_coords <- mds_model$points
print(mds_coords)
```

```
##                       [,1]        [,2]
## Atlanta         -616.46326  -277.03319
## Chicago         -288.61063   -22.16151
## Denver           202.61148  -672.61019
## Houston           14.25242  -335.54496
## Los Angeles     1225.78174 -1033.78934
## Miami           -968.45797  -264.31832
## New York        -845.50822   757.66327
## San Francisco   1645.58380   339.92746
## Seattle          563.12009  1646.43854
## Washington D.C. -932.30945  -138.57175
```

- The first column [,1] represents the x-coordinate (the position) of each city along the first dimension.
- Positive values indicate positions to the right of the origin, while negative values indicate positions to the left.
- The second column [,2] represents the y-coordinate (the position) of each city along the second dimension.
- Positive values indicate positions above the origin, while negative values indicate positions below.

d)

```r
# Bi-plot of the model
plot(mds_coords, type = "n")
text(mds_coords, labels = city_names, cex = 0.7)
title("Classical MDS of US Cities")
```



- From the Bi-plot we get the conclusion that.
- Seattle and San Francisco are farthest from most of the cities.
- Chichago and Houston are closest to most of the cities.