```r
# Assignment: ASSIGNMENT 11.2.2
# Name: Anjale, Jiteshwar
# Date: 2021-05-29
# Clustering

## Load the package
library(tidyverse)  # data manipulation
```

```
## Warning: package 'tidyverse' was built under R version 4.0.5
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.
3.1 --
```

```
## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.1.0     v dplyr   1.0.5
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1
```

```
## Warning: package 'tidyr' was built under R version 4.0.5
```

```
## Warning: package 'readr' was built under R version 4.0.5
```

```
## Warning: package 'purrr' was built under R version 4.0.5
```

```
## Warning: package 'dplyr' was built under R version 4.0.5
```

```
## Warning: package 'stringr' was built under R version 4.0.5
```

```
## Warning: package 'forcats' was built under R version 4.0.5
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflict
s() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```r
library(cluster)    # clustering algorithms
```

```
## Warning: package 'cluster' was built under R version 4.0.5
```

```r
library(factoextra) # clustering algorithms & visualization
```

```
## Warning: package 'factoextra' was built under R version 4.0.5
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://g
oo.gl/ve3WBa
```

```r
setwd('C:/Users/anjal/OneDrive/Desktop/MS/DSC520/dsc520')

# Load the `data/clustering-data.csv` to
cluster_df <- read.csv("C:/Users/anjal/OneDrive/Desktop/MS/DSC520/dsc520/data
/clustering-data.csv")
```

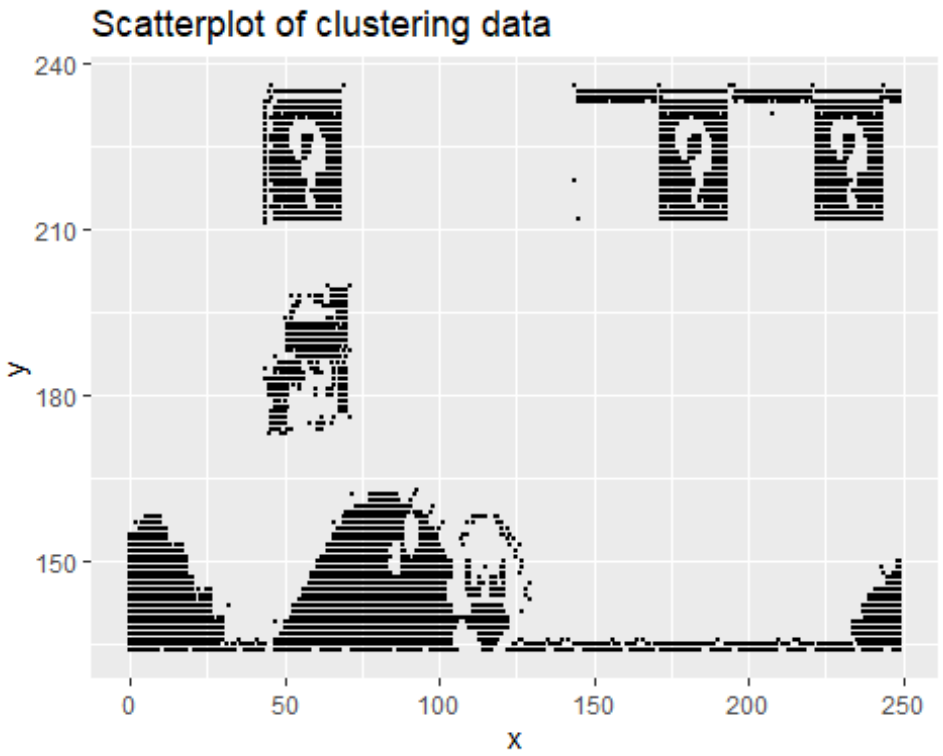
```
# Examine the structure of `clustering-data.csv` using `str()`
str(cluster_df)
```

```
## 'data.frame':    4022 obs. of  2 variables:
##  $ x: int  46 69 144 171 194 195 221 244 45 47 ...
##  $ y: int  236 236 236 236 236 236 236 236 235 235 ...
```

```
# Show the top rows of clustering-data.csv
head(cluster_df)
```

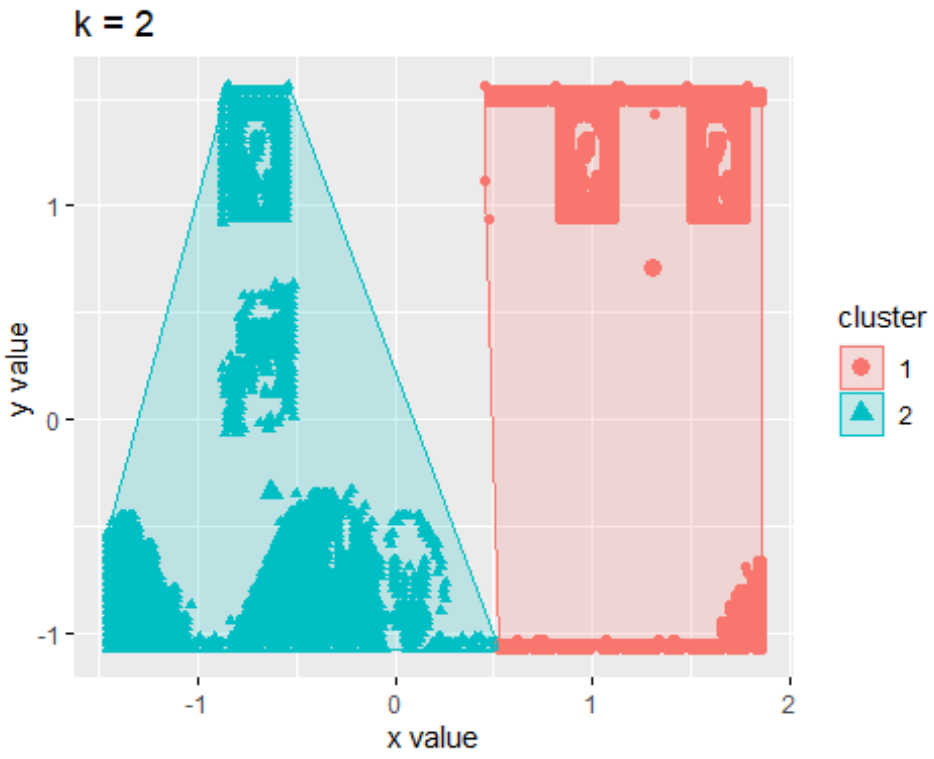
```
##     x   y
## 1  46 236
## 2  69 236
## 3 144 236
## 4 171 236
## 5 194 236
## 6 195 236
```

```
# i.Plot the dataset using a scatter plot.
# scatter plot of data
library(ggplot2)
ggplot(data = cluster_df, aes(x=x, y=y)) +
  geom_point(size = 0.4) +
  ggtitle("Scatterplot of clustering data")
```

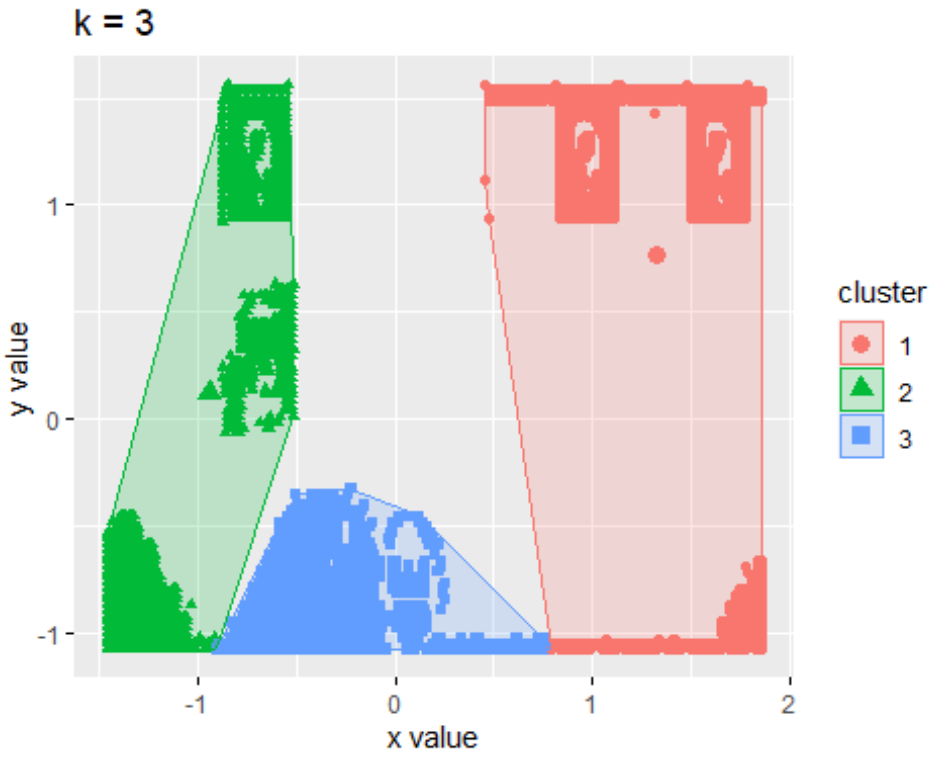



```
# ii.Fit the dataset using the k-means algorithm from k=2 to k=12. Create a s
catter plot of the resultant clusters for each value of k.
```

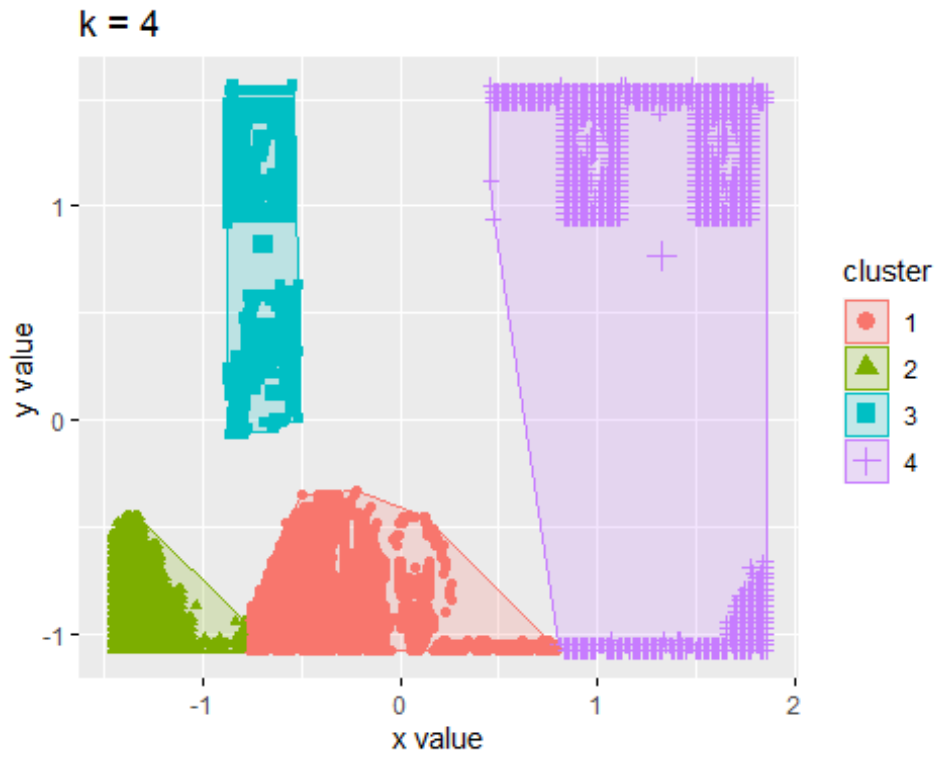
```r
#Kmeans for k=2
set.seed(123)
kmeans_2 <- kmeans(cluster_df, 2, iter.max = 300, nstart = 10)

#Kmeans for k=3
set.seed(123)
kmeans_3 <- kmeans(cluster_df, 3, iter.max = 300, nstart = 10)

#Kmeans for k=4
set.seed(123)
kmeans_4 <- kmeans(cluster_df, 4, iter.max = 300, nstart = 10)

#Kmeans for k=5
set.seed(123)
kmeans_5 <- kmeans(cluster_df, 5, iter.max = 300, nstart = 10)

#Kmeans for k=6
set.seed(123)
kmeans_6 <- kmeans(cluster_df, 6, iter.max = 300, nstart = 10)

#Kmeans for k=7
set.seed(123)
kmeans_7 <- kmeans(cluster_df, 7, iter.max = 300, nstart = 10)

#Kmeans for k=8
set.seed(123)
kmeans_8 <- kmeans(cluster_df, 8, iter.max = 300, nstart = 10)

#Kmeans for k=9
set.seed(123)
kmeans_9 <- kmeans(cluster_df, 9, iter.max = 300, nstart = 10)

#Kmeans for k=10
set.seed(123)
kmeans_10 <- kmeans(cluster_df, 10, iter.max = 300, nstart = 10)

#Kmeans for k=11
set.seed(123)
kmeans_11 <- kmeans(cluster_df, 11, iter.max = 300, nstart = 10)

#Kmeans for k=12
set.seed(123)
kmeans_12 <- kmeans(cluster_df, 12, iter.max = 300, nstart = 10)


# plots to compare

#Scatter plot for k=2
fviz_cluster(kmeans_2, geom = "point", data = cluster_df) + ggtitle("k = 2")
```



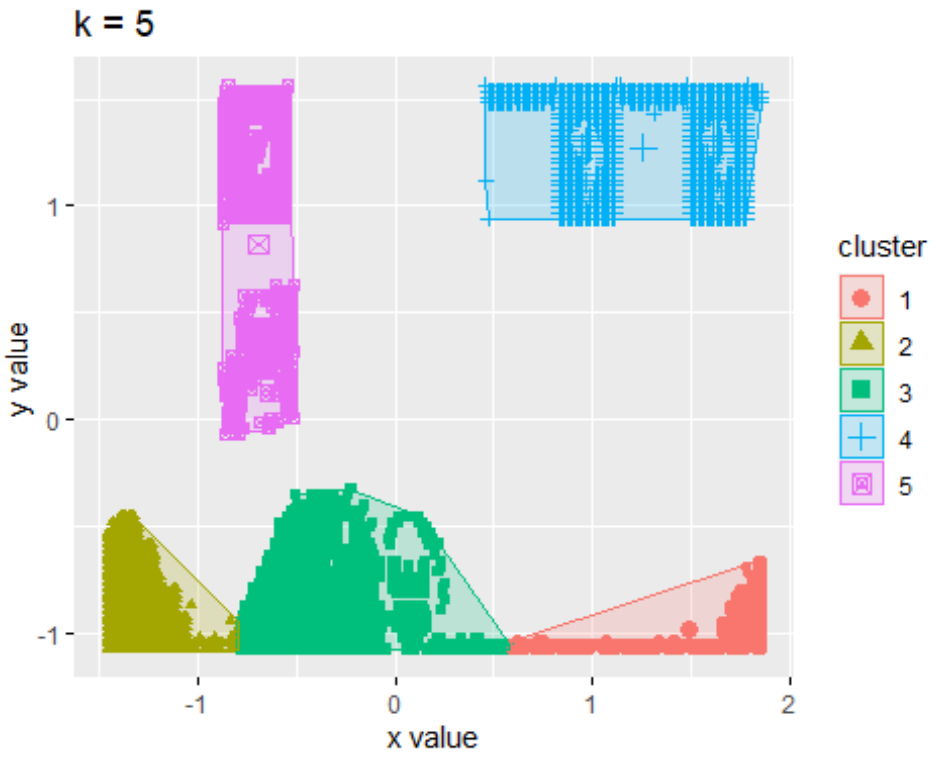

```r
#Scatter plot for k=3
fviz_cluster(kmeans_3, geom = "point",  data = cluster_df) + ggtitle("k = 3")
```



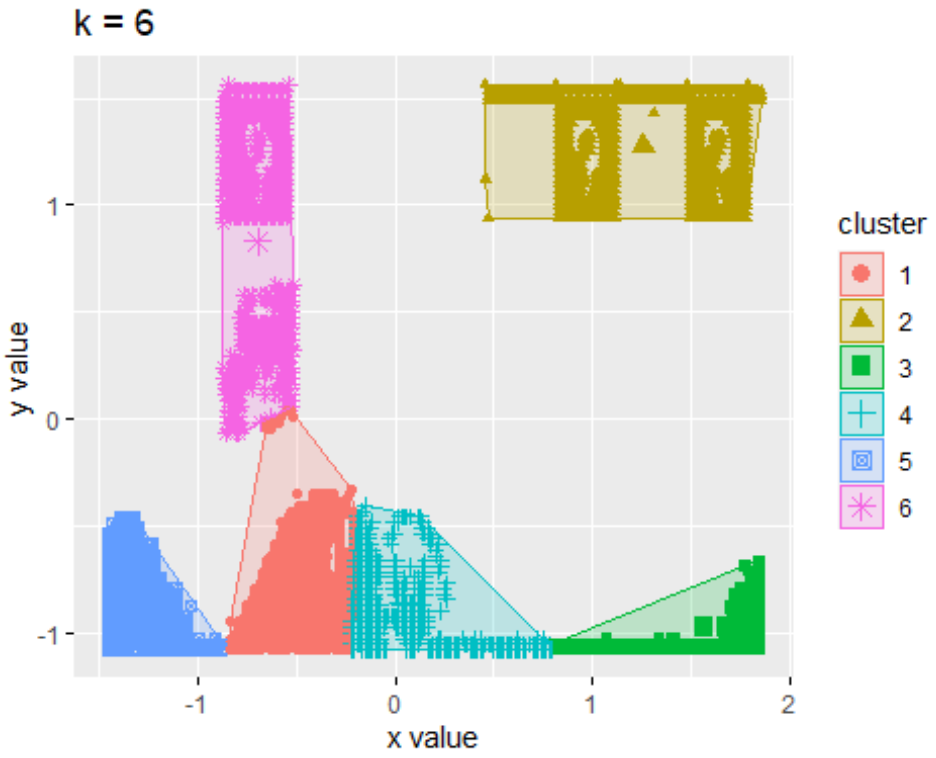
```r
#Scatter plot for k=4
fviz_cluster(kmeans_4, geom = "point",  data = cluster_df) + ggtitle("k = 4")
```



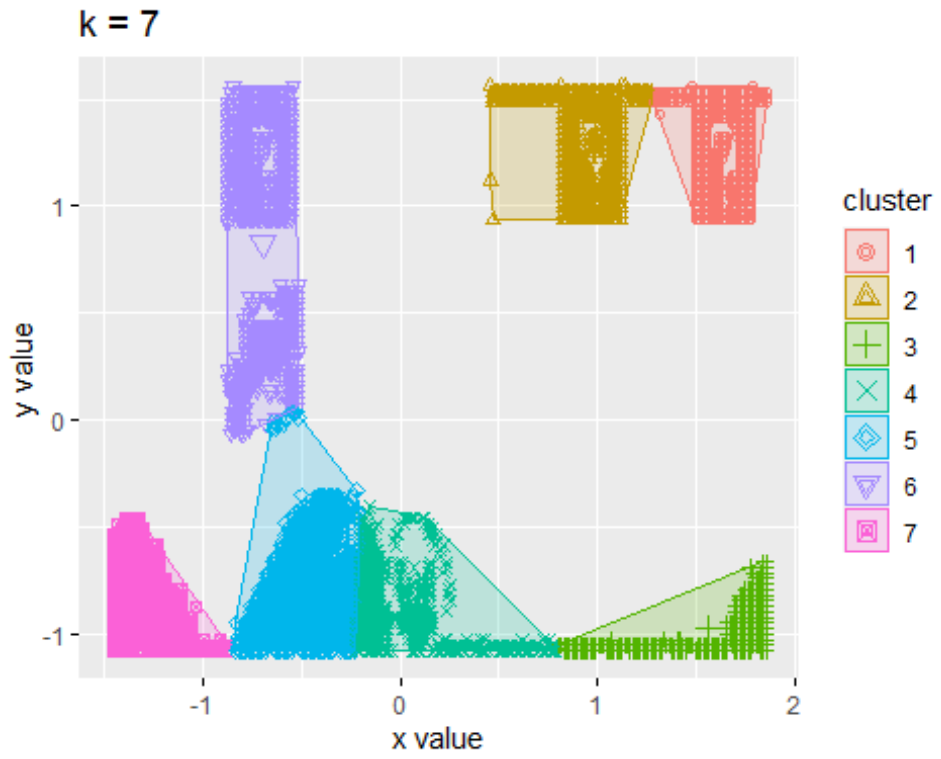

```r
#Scatter plot for k=5
fviz_cluster(kmeans_5, geom = "point",  data = cluster_df) + ggtitle("k = 5")
```



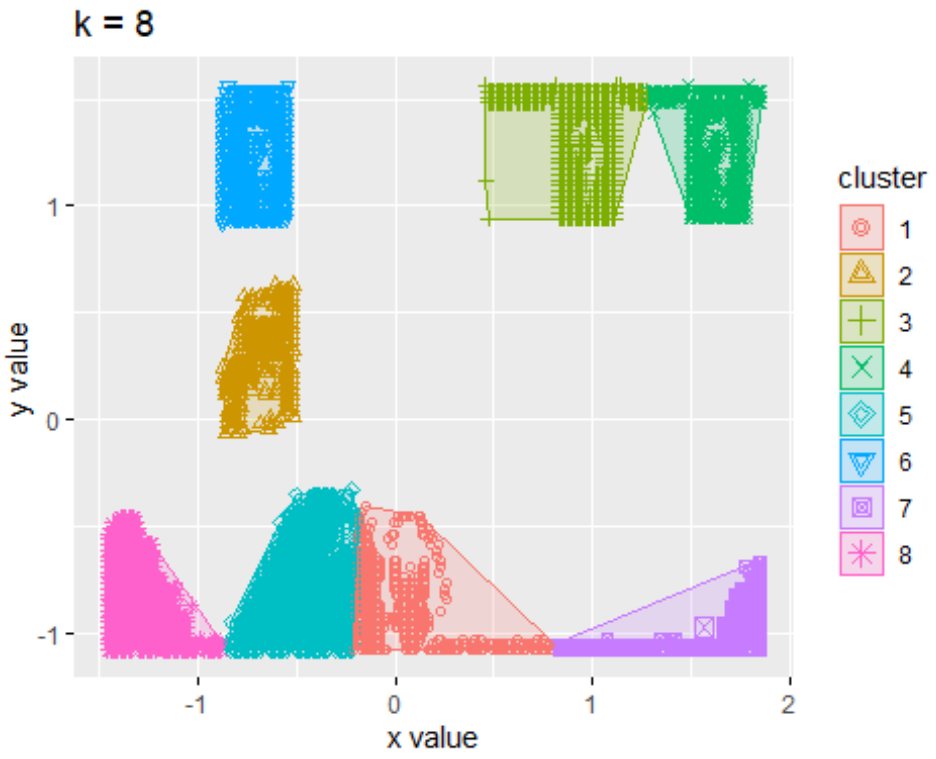

```
#Scatter plot for k=6
fviz_cluster(kmeans_6, geom = "point", data = cluster_df) + ggtitle("k = 6")
```



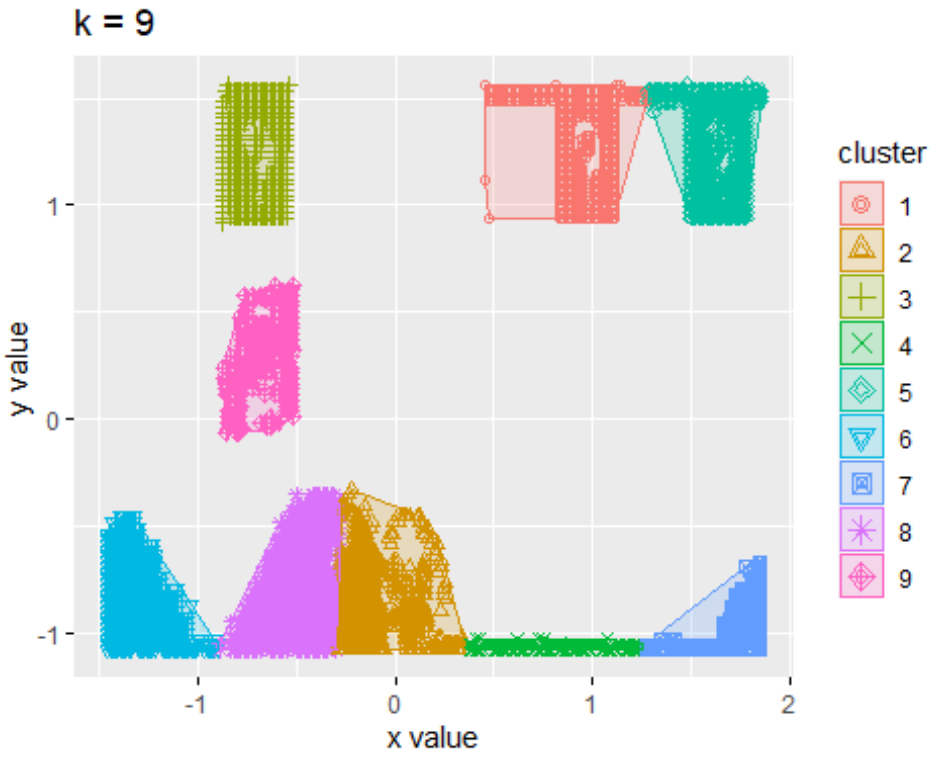
```
#Scatter plot for k=7
fviz_cluster(kmeans_7, geom = "point",  data = cluster_df) + ggtitle("k = 7")
```



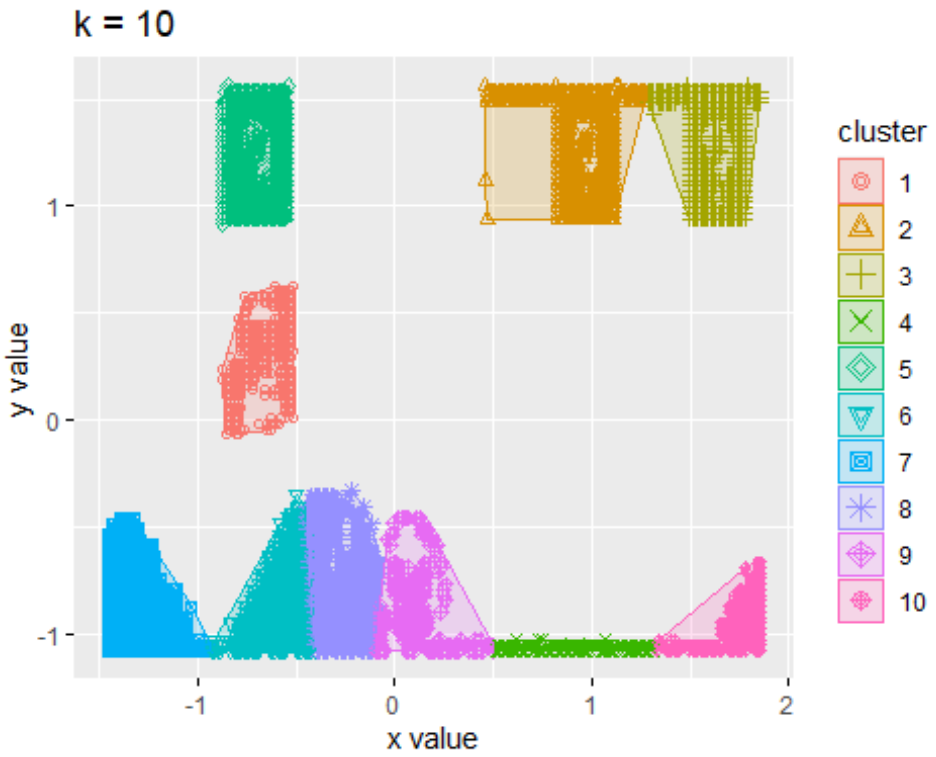

```
#Scatter plot for k=8
fviz_cluster(kmeans_8, geom = "point",  data = cluster_df) + ggtitle("k = 8")
```



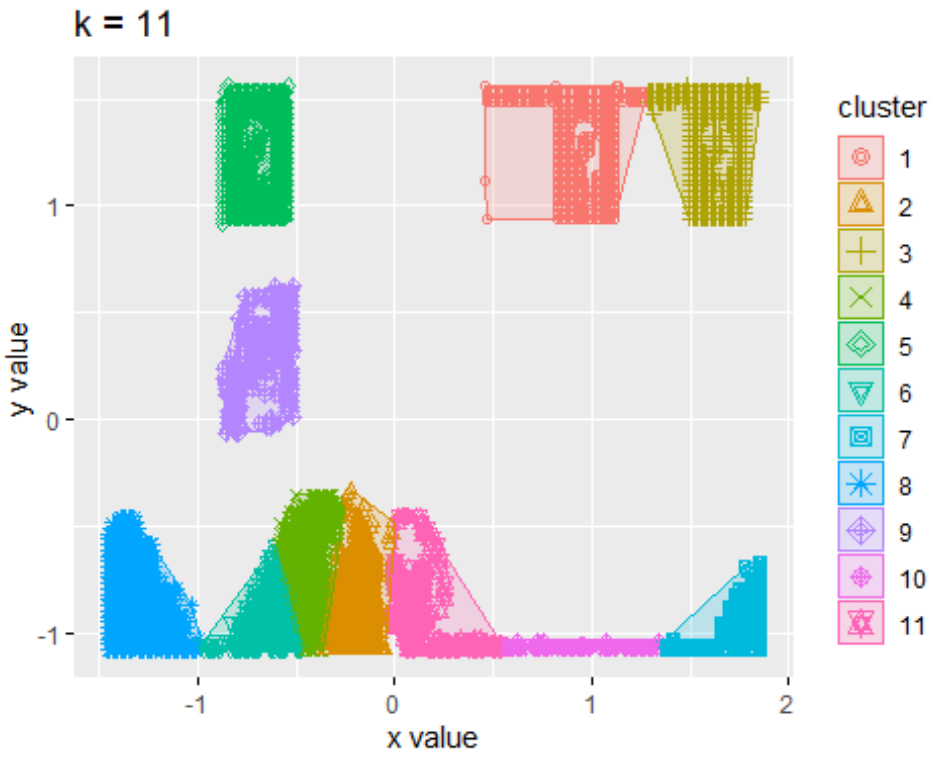

```
#Scatter plot for k=9
fviz_cluster(kmeans_9, geom = "point",  data = cluster_df) + ggtitle("k = 9")
```



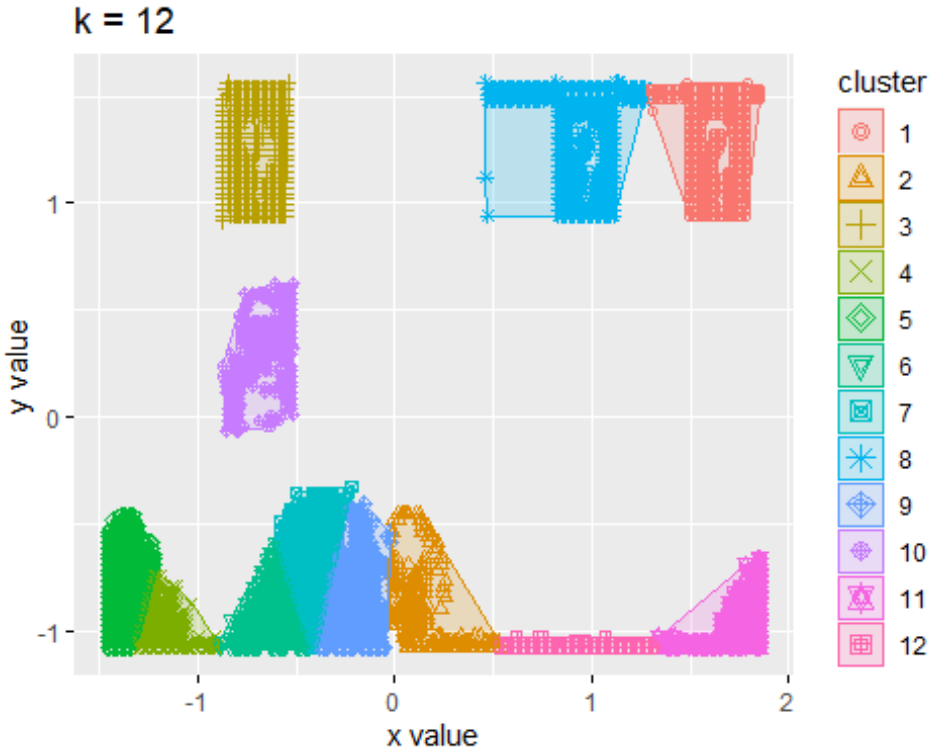
```r
#Scatter plot for k=10
fviz_cluster(kmeans_10, geom = "point", data = cluster_df) + ggtitle("k = 10"
)
```



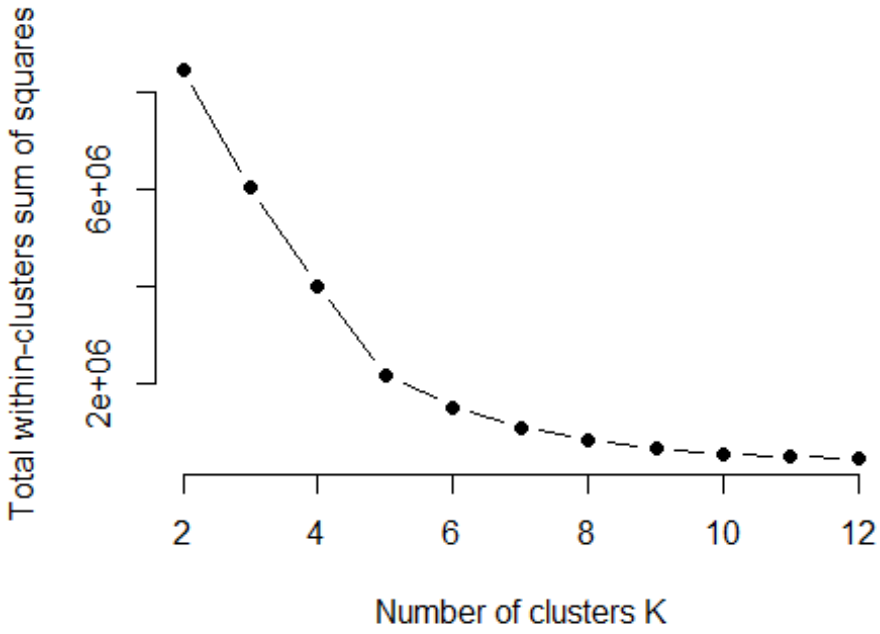

```r
#Scatter plot for k=11
fviz_cluster(kmeans_11, geom = "point",  data = cluster_df) + ggtitle("k = 11
")
```




```
#Scatter plot for k=12
fviz_cluster(kmeans_12, geom = "point",  data = cluster_df) + ggtitle("k = 12
")
```



```r
set.seed(123)

# function to compute total within-cluster sum of square
wss <- function(k) {
  kmeans(cluster_df, k, nstart = 25 )$tot.withinss
}

# Compute and plot wss for k = 1 to k = 15
k.values <- 2:12

# extract wss for 2-15 clusters
wss_values <- map_dbl(k.values, wss)

#Plotting Elbow curve
plot(k.values, wss_values,
     type="b", pch = 19, frame = FALSE,
     xlab="Number of clusters K",
     ylab="Total within-clusters sum of squares")
```




```r
#The results suggest that 6 is the optimal number of clusters as it appears t
o be the bend in elbow.
```