Homework 02 Data Handling, Graphics, More R

Due by 11:59pm, Friday, 2.3.23

S&DS 230/530/ENV 757

(1) Obama Tweets: Retweets vs. Favorites A `.CSV` file containing recent Tweets from former President Barack Obama can be downloaded HERE. The data is sorted by date, most recent at the top.

The variables (columns) are:

- `text`: the body of the tweet
- `date`: when the tweet was sent, original format
- `date2`: when the tweet was sent, JUST the day (not the time of day)
- `retweet_count`: how many people retweeted this tweet
- `favorite_count`: how many people favorited this tweet
- `is_retweet`: whether or not this tweet is a retweet of someone else's tweet
- `source`: device used to send the tweet
- `is_quote`: is the tweet a quote of someone else
- `is_reply`: is the tweet a reply

There are two ways in which other Twitter users can indicate support for a tweet: *favoriting* and *retweeting*. For example, if a tweet has `favorite_count` = 5 and `retweet_count` = 10, then this suggests that 5 people favorited the tweet (saved it) and 10 people retweeted it (broadcasted it to their followers).

(1.1) Insert an R code chunk right below this that imports the data into a dataframe called `recent`. Note that the data is sorted in reverse time order. Get the header names of `recent` to confirm that the data imported correctly. Look at the first few rows of the data and the final few rows of the data. Also get the dimension of `recent`. What is the date range of the tweets? How many tweets does this dataset include?

```r
recent <- read.csv("http://reuningscherer.net/S&DS230/data/ObamaTweets.csv", header = TRUE)
names(recent)
```

```
##  [1] "X"              "text"           "date"           "source"
##  [5] "is_quote"       "is_retweet"     "is_reply"       "favorite_count"
##  [9] "retweet_count"  "date2"
```

```r
head(recent)
```

```
##   X
## 1 1
## 2 2
## 3 3
## 4 4
## 5 5
## 6 6
##
## 1
## 2
## 3                       This week, Illinois joined states across the country in passing a historic gu
## 4
## 5
## 6 If you haven’t already, I hope you’ll take some time to watch Descendant on @Netflix. It’s an impor
##                   date
## 1 2023-01-13 13:30:43
## 2 2023-01-13 13:30:43
## 3 2023-01-12 08:30:25
## 4 2023-01-11 10:45:56
## 5 2023-01-11 09:31:33
## 6 2023-01-10 14:37:04
##                                                                                source
## 1 <a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>
## 2 <a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>
## 3 <a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>
## 4 <a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>
## 5 <a href="http://twitter.com/download/iphone" rel="nofollow">Twitter for iPhone</a>
## 6            <a href="https://mobile.twitter.com" rel="nofollow">Twitter Web App</a>
##   is_quote is_retweet is_reply favorite_count retweet_count      date2
## 1    FALSE      FALSE     TRUE           4045           847 2023-01-13
## 2    FALSE      FALSE    FALSE          15256          1563 2023-01-13
## 3    FALSE      FALSE    FALSE          28154          3760 2023-01-12
## 4    FALSE      FALSE    FALSE              0           347 2023-01-11
## 5    FALSE      FALSE    FALSE              0          3145 2023-01-11
## 6    FALSE      FALSE     TRUE           8404          1310 2023-01-10
```

```
tail(recent)
```

```
##         X
## 1995 1995
## 1996 1996
## 1997 1997
## 1998 1998
## 1999 1999
## 2000 2000
##
## 1995                            It’s time for the United States to #LeadOnLeave-show your support if
## 1996                                    Retweet if you believe it’s time for the United States to #L
## 1997                                          Speak up for a fair hearing for Judge Merrick Garland:
## 1998                                                                          This is unprecedented.
## 1999 Add a comment if you agree: American workers shouldn’t have to choose between their health and a
## 2000                Working families in America should have the basic security of paid sick leave. #
##                     date
## 1995 2016-04-11 10:11:20
## 1996 2016-04-11 08:34:06
## 1997 2016-04-08 14:23:02
## 1998 2016-04-08 11:52:17
## 1999 2016-04-08 10:04:33
## 2000 2016-04-08 08:45:49
##                                                                   source
## 1995 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
## 1996 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
## 1997 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
## 1998 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
## 1999 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
## 2000 <a href="http://twitter.com" rel="nofollow">Twitter Web Client</a>
##      is_quote is_retweet is_reply favorite_count retweet_count      date2
## 1995    FALSE      FALSE    FALSE           1544           378 2016-04-11
## 1996    FALSE      FALSE    FALSE           6015          3184 2016-04-11
## 1997    FALSE      FALSE    FALSE           2271           762 2016-04-08
## 1998    FALSE      FALSE    FALSE           4388          1890 2016-04-08
## 1999    FALSE      FALSE    FALSE           3141           724 2016-04-08
## 2000    FALSE      FALSE    FALSE           7082          1732 2016-04-08
```

```
dim(recent)
```

```
## [1] 2000   10
```

```
range(recent$date, na.rm = TRUE)
```

```
## [1] "2016-04-08 08:45:49" "2023-01-13 13:30:43"
```

```
difftime("2023-01-13", "2016-04-08", units = "days")
```

```
## Time difference of 2471.042 days
```

```
length(recent$text)
```

```
## [1] 2000
```

In the Obama Tweets Dataset, there are 10 headers. The dimensions of the dataset are 2000 rows and 10 columns, which means there are 2000 tweets in the given dataset. The tweets date ranges from "2016-04-08" to "2023-01-13."

(1.2) Create a table that shows how many of the Tweets were quotes (that is, President Obama retweeted someone elses tweet but added additional commentary), and call this object `table1`. Show the results of `table1`. Write a single line that calculates the percent of Tweets that were quotes, rounds this value to two decimal places, multipies the results by 100, and pastes on a "%" symbol. There should be no space between the number and the '%' symbol. Finally, have the entire line read "?% of Obama's tweets were quotes", where ? is the calculated percentage.

```
table1 <- table(recent$is_quote)
table1
```

```
##
## FALSE  TRUE
##  1817   183
```

```
paste0(round(table1[2]/(table1[1] + table1[2]), digits = 2)*100, "% of Obama's tweets were quotes.", se
```

```
## [1] "9% of Obama's tweets were quotes."
```

(1.3) Get summary statistics for both `favorite_count` and `retweet_count`. Make histograms for each of these two variables as well. Put a title on each histogram, label the horizontal axis, and make the bars orange. How would you describe the shape of these distributions (use words like 'symmetric' or 'skewed', or perhaps the name of some distribution that has a similar shape . . .)?

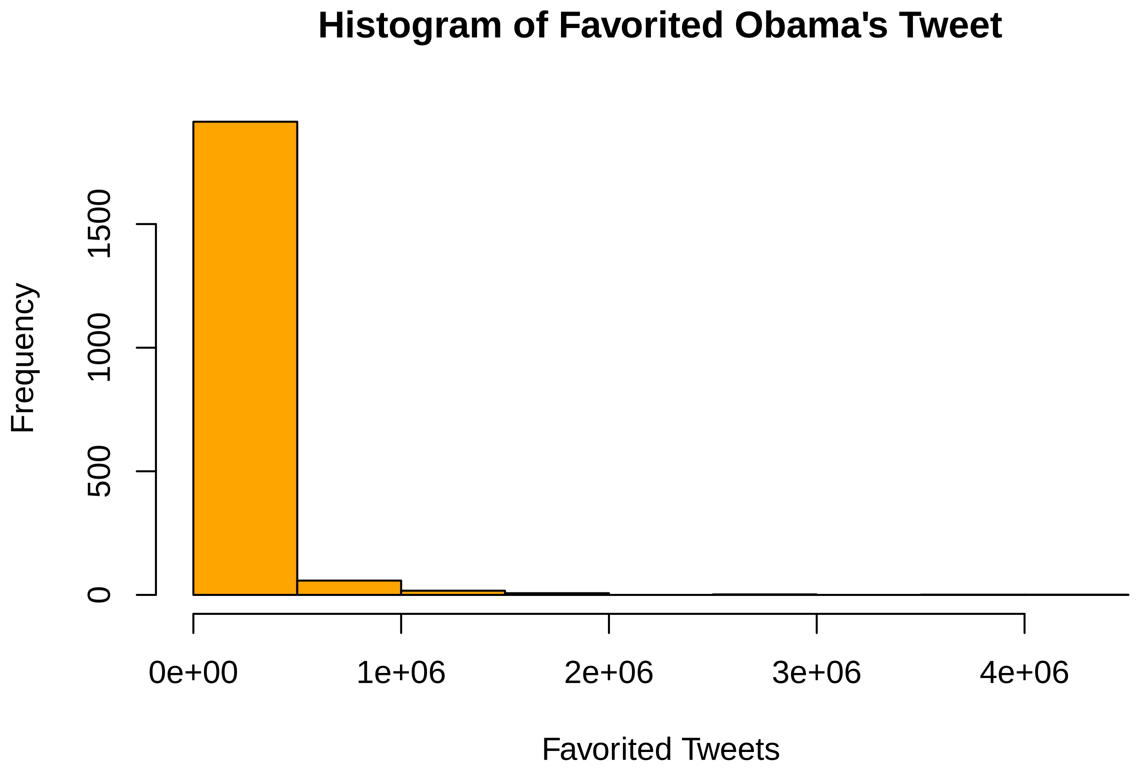
```
summary(recent$favorite_count)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0    3969   15358   96327   78010 4010967
```

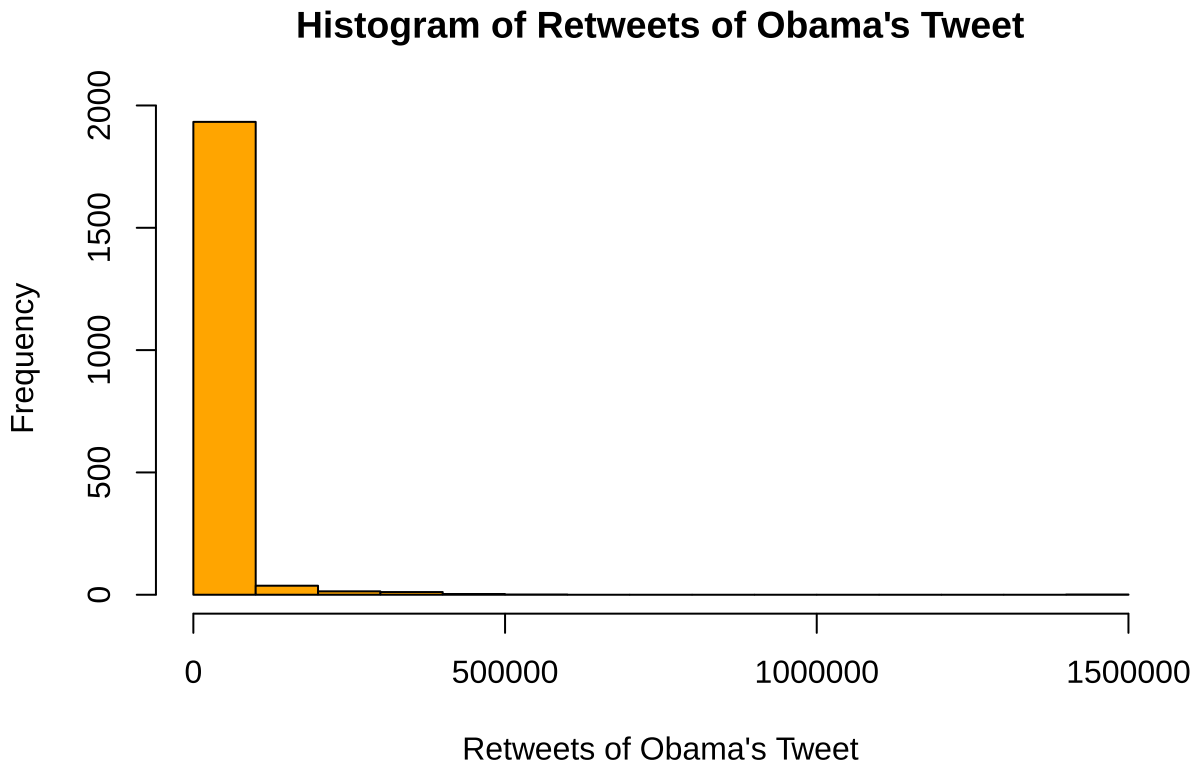
```
summary(recent$retweet_count)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     198    1164    3071   16841   12153 1435375
```

```
hist(recent$favorite_count,
     col = "orange",
     main = "Histogram of Favorited Obama's Tweet",
     xlab = "Favorited Tweets")
```



```
hist(recent$retweet_count,
     col = "orange",
     main = "Histogram of Retweets of Obama's Tweet",
     xlab = "Retweets of Obama's Tweet")
```



Both the histograms depicts right-skewed exponential distribution as we can see the highest peak on the left side of the graphs. The graph also has one clear peak hence unimodal.

(1.4) Get summary statistics for `favorite_count` FIRST for the observations for which `is_quote` is `TRUE`, then for the observations for which ’is_quote`is`FALSE‘. Compare the medians of these two distributions - what do you observe?

```
summary(subset(recent$favorite_count, recent$is_quote == TRUE))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0   14492   58453  114081  164038 1159695
```

```
summary(subset(recent$favorite_count, recent$is_quote == FALSE))
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0    3474   13278   94539   69172 4010967
```

The median of the favorite_counts subset where ‘is_quote’ is TRUE has a higher median than where ‘is_quote’ is FALSE which means that the people Favorited tweets which are quote of someone else in comparison to the tweets which are not quoted (original texts) (i.e Favorited less by the people).

(1.5) Create a new dataframe called `recent_NoQuote` that contains all data from `recent` for which `is_quote` is `FALSE` (essentially, we’re removing quotes and only looking at strictly original texts). USE THIS NEW DATAFRAME for the remainder of this problem set. Get the dimension of this dataframe to make sure the remaining number of rows (and columns) are consistent with the results in part 1.2.

```
recent_NoQuote <- subset(recent, recent$is_quote == FALSE)
dim(recent_NoQuote)
```

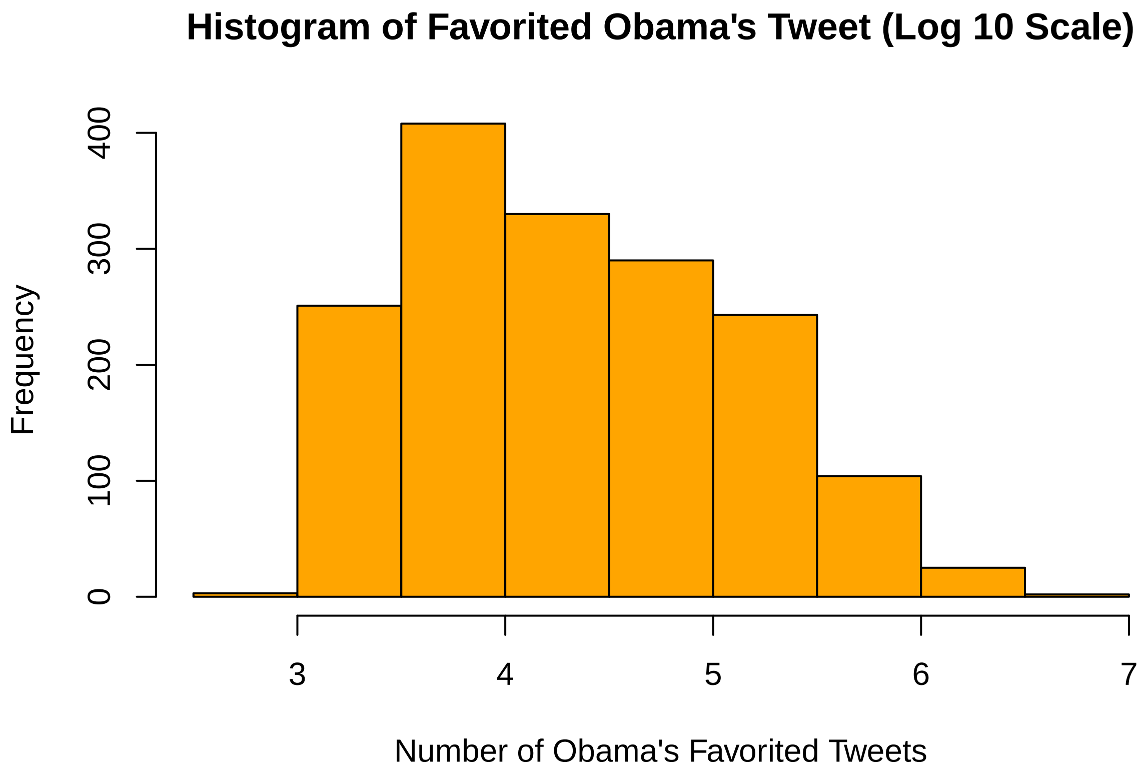
```
## [1] 1817   10
```

(1.6) Make two new variables as a part of `recent_NoQuote` which will be the log base 10 transformations of `favorite_count` and `retweet_count`. Call these variables `log10favCnt` and `log10reCnt`, respectively. The function you want to take log base 10 is called `log10()`. **Note** - you can add a variable to dateframe by simply creating a name using the `$` operator and then assigning it the desired value : e.g. `recent_NoQuote$log10facCnt <-` *(whatever you want to assign this)*

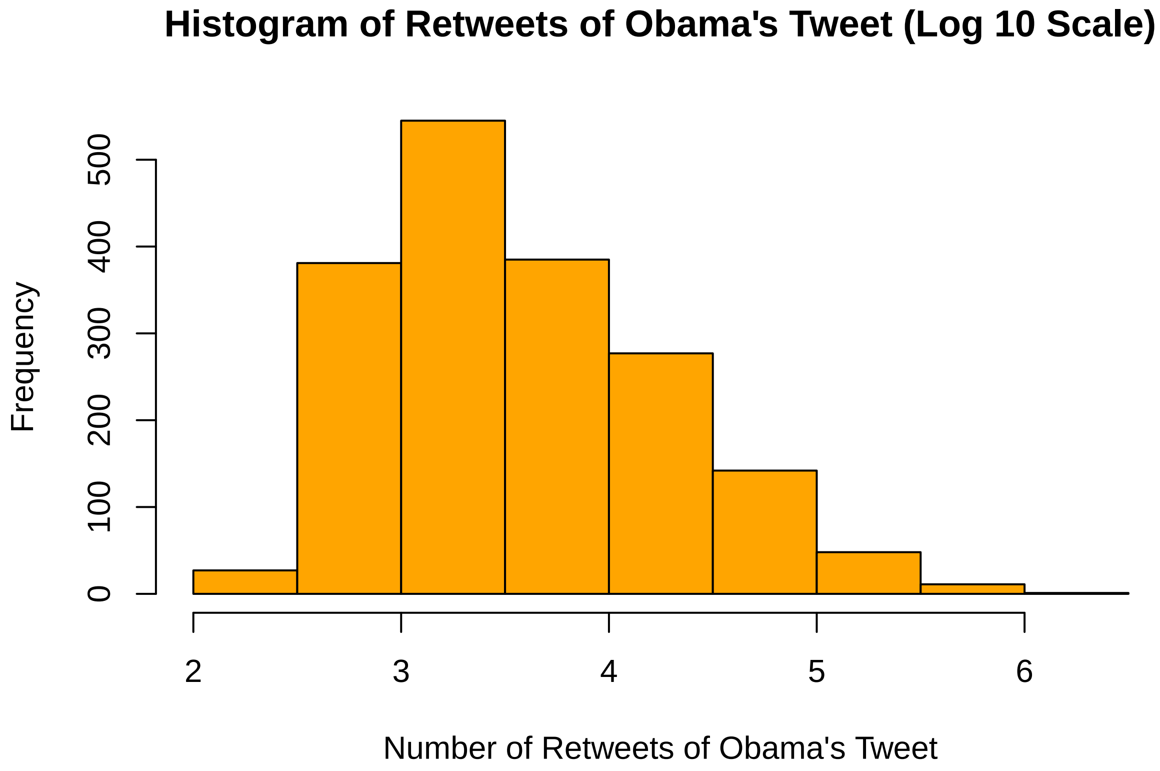
```
recent_NoQuote$log10facCnt <- log10(recent_NoQuote$favorite_count)
recent_NoQuote$log10reCnt <- log10(recent_NoQuote$retweet_count)
```

(1.7) Make histograms of these two new log-scale variables. Put a title on each histogram, label the horizontal axis, and make the bars orange. How would you describe the shape of these transformed distributions (use words like 'symmetric' or 'skewed', or perhaps the name of some distribution that has a simlar shape . . .)?

```
hist(recent_NoQuote$log10facCnt,
     col = "orange",
     main = "Histogram of Favorited Obama's Tweet (Log 10 Scale)",
     xlab = "Number of Obama's Favorited Tweets")
```



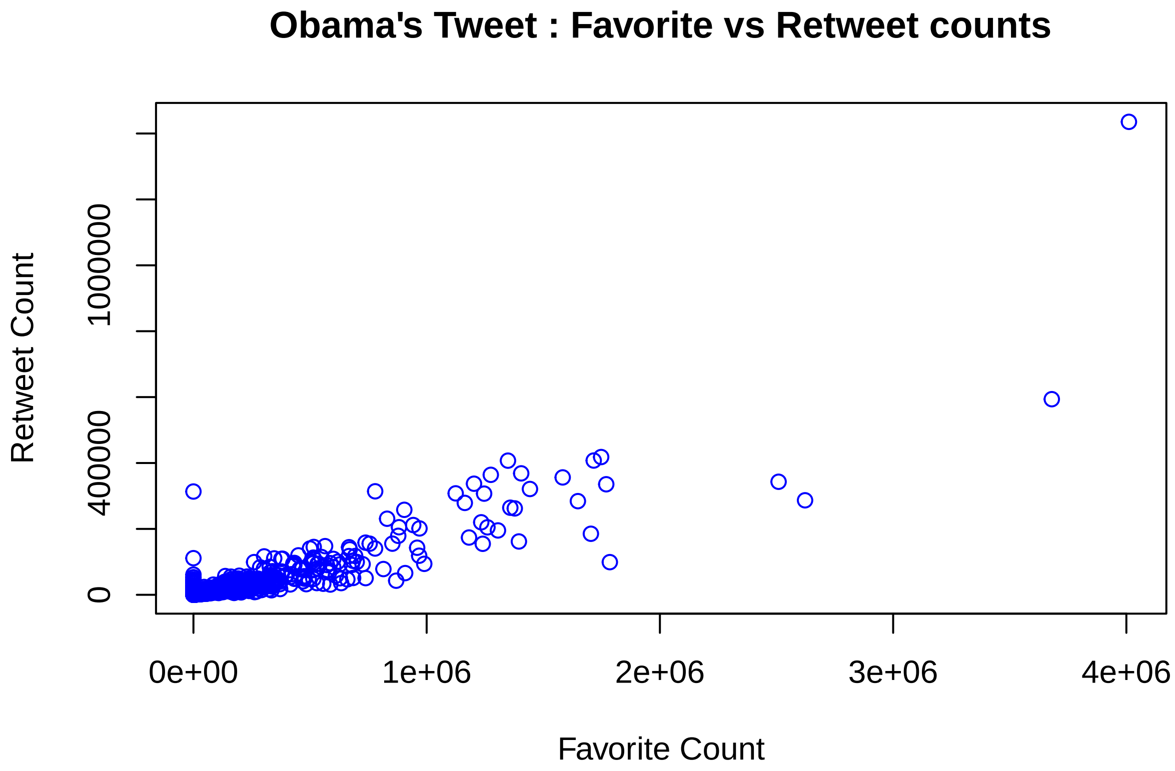
```
hist(recent_NoQuote$log10reCnt,
     col = "orange",
     main = "Histogram of Retweets of Obama's Tweet (Log 10 Scale)",
     xlab = "Number of Retweets of Obama's Tweet")
```



Both the histograms still seems to as a right skewed distribution. Since both the histograms are not symmetric we can't call them as normal distribution. However, in comparison to the previous histograms they are less right skewed and closer to the normal distribution rather than exponential distribution.

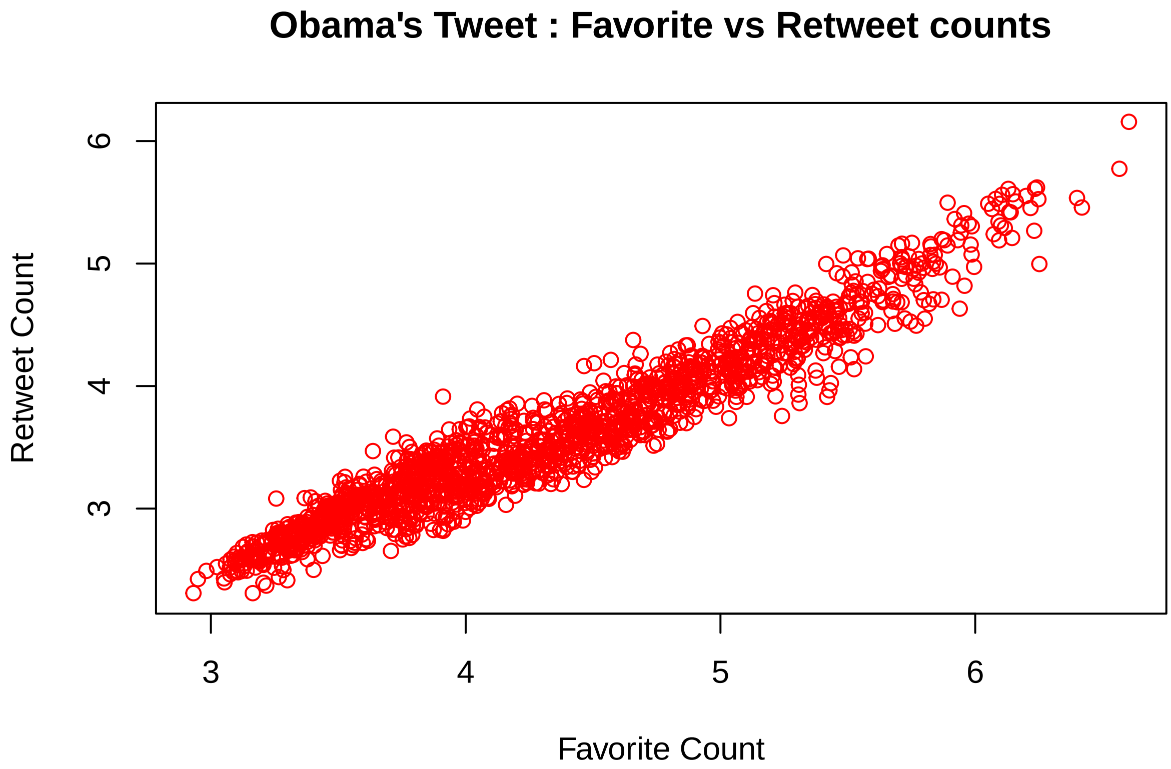
(1.8) Make a plot of the number of times that each tweet was favorited vs. the number of times a tweet was retweeted. Put `favorite_count` on the x-axis and `retweet_count` on the y-axis. Label your axes, put on a main title, and make the plot characters blue.

```
plot(recent_NoQuote$favorite_count, recent_NoQuote$retweet_count,
     col = 'blue',
     main = "Obama's Tweet : Favorite vs Retweet counts",
     xlab = "Favorite Count",
     ylab = "Retweet Count")
```



(1.9) Repeat part (1.8) but use the log-transformed variables. Label your axes, put on a main title, and make the plot characters red. How does the scatterplot on the log-scale compare to the scatterplot on the raw scale? Which one do you prefer?

```
plot(recent_NoQuote$log10facCnt, recent_NoQuote$log10reCnt,
     col = "red",
     main = "Obama's Tweet : Favorite vs Retweet counts",
     xlab = "Favorite Count",
     ylab = "Retweet Count")
```



I would prefer log-scale scatterplot as the log transformation of the data resulted in a better visualization and easier to analyse. A log transformation preserves the order of the observations while making outliers less extreme. In the log scale we can clearly see the linear trend (i.e. straight line), depicting that as x variable increases, y variable tends to increase.However, in the raw data scatterplot the trend is unclear.

(1.10) Create two new variables on the `recent_NoQuote` dataframe called `year` and `month` that will contain respectively the year and month the tweet was created. You'll need to look up how to use the function `substr()`. You'll also need to use the `as.numeric()` function to make sure that both new variables are numbers. Show the first 20 observations for each resulting variable.

```
recent_NoQuote$year <- as.numeric(substr(as.Date(recent_NoQuote$date2, format = "%Y-%m-%d"), 1,4))

head(recent_NoQuote$year, 20)
```

```
##  [1] 2023 2023 2023 2023 2023 2023 2023 2023 2023 2023 2023 2022 2022 2022 2022
## [16] 2022 2022 2022 2022 2022
```

```
recent_NoQuote$month <- as.numeric(substr(as.Date(recent_NoQuote$date2, format = "%Y-%m-%d"), 6,7))

head(recent_NoQuote$month, 20)
```

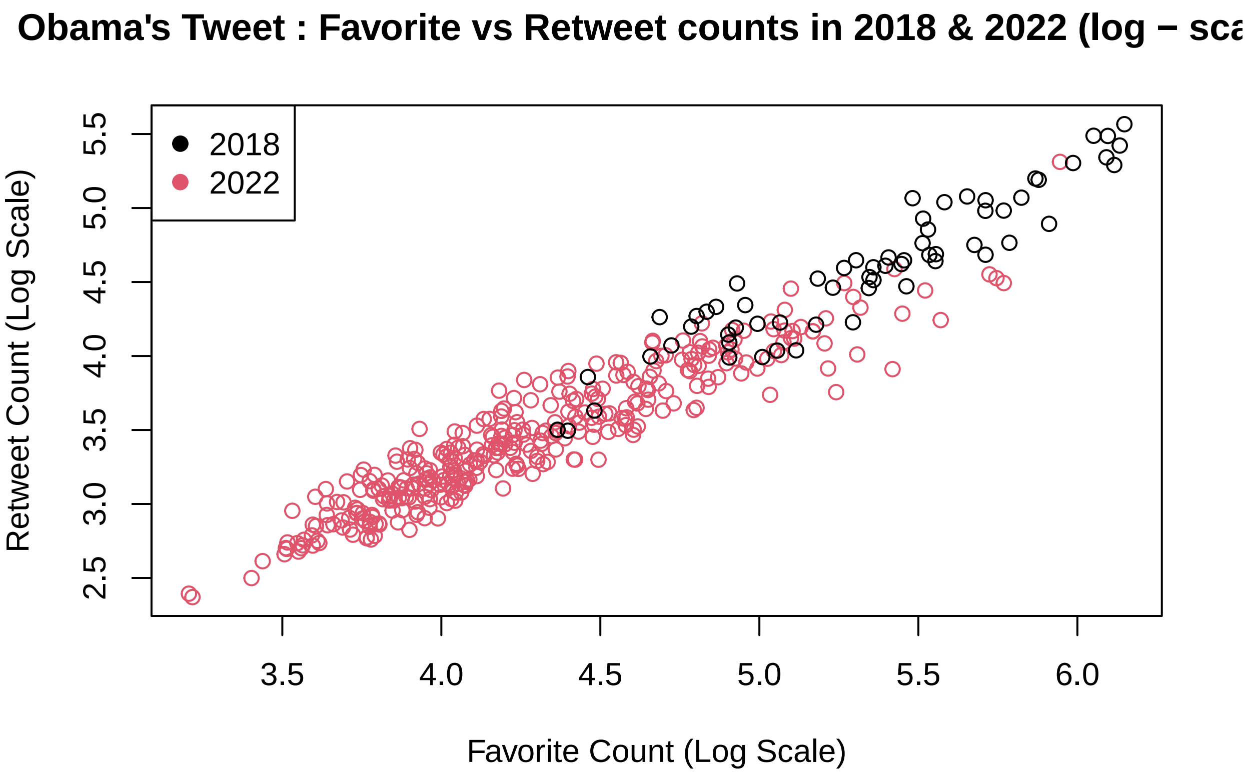
```
##  [1]  1  1  1  1  1  1  1  1  1  1  1 12 12 12 12 12 12 12 12 12
```

(1.11) Repeat part (1.9) BUT only for 2018 and 2022 First, create a dataframe called `recent_3` that only has observations from the specified years. You might want to use the `%in%` operator on your newly created variable year. Use this new dataframe to make your plot. Use the graphics option `pch = 19` to get solid round points, and use the graphics option `col = as.factor(year)` to make different colors for 2018 and 2022 The final line of code below will add a legend to the top left of the plot.

```
recent_3 <- subset(recent_NoQuote, year %in% c("2022", "2018"))

plot(recent_3$log10facCnt, recent_3$log10reCnt,
     main = "Obama's Tweet : Favorite vs Retweet counts in 2018 & 2022 (log - scale)",
     xlab = "Favorite Count (Log Scale)",
     ylab = "Retweet Count (Log Scale)",
     col = as.factor(recent_3$year))

legend("topleft",
       legend = c("2018","2022"),
       col = c(1,2),
       pch = 19)
```



(1.12) Write no more than three sentences that describe what you see.Does the pattern appear any different between 2018 and 2022?

Both the year's show a linear trend. From the graph we can see that the Obama's tweets in the year 2018 were more liked and re-tweeted by the people than the tweets made in the year 2022. But, the 2022 data is more clustered and dense between the points 3.8 to 4.8 whereas the data is scattered in the year 2018.This could be due to higher number of tweets made by Obama in the year 2022 than 2018.