```
library(tidyverse)  #helps wrangle data
# Use the conflicted package to manage conflicts
library(conflicted)

# Set dplyr::filter and dplyr::lag as the default choices
conflict_prefer("filter", "dplyr")
conflict_prefer("lag", “dplyr")



#=====================
# STEP 1: COLLECT DATA
#=====================
# # Upload Divvy datasets (csv files) here
q1_2019 <- read_csv("Divvy_Trips_2019_Q1.csv")
q1_2020 <- read_csv("Divvy_Trips_2020_Q1.csv")


#=====================================================
# STEP 2: WRANGLE DATA AND COMBINE INTO A SINGLE FILE
#=====================================================
# Compare column names each of the files
# While the names don't have to be in the same order, they DO need to match perfectly before we can use a command to join them into one file

colnames(q1_2019)
colnames(q1_2020)
```

Rename columns to make them consistent with q1_2020 (as this will be the supposed going-forward table design for Divvy)

```
(q1_2019 <- rename(q1_2019
            ,ride_id = trip_id
            ,rideable_type = bikeid
            ,started_at = start_time
            ,ended_at = end_time
            ,start_station_name = from_station_name
            ,start_station_id = from_station_id
            ,end_station_name = to_station_name
            ,end_station_id = to_station_id
            ,member_casual = usertype
            ))
```

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> (q1_2019 <- rename(q1_2019
+                    ,ride_id = trip_id
+                    ,rideable_type = bikeid
+                    ,started_at = start_time
+                    ,ended_at = end_time
+                    ,start_station_name = from_station_name
+                    ,start_station_id = from_station_id
+                    ,end_station_name = to_station_name
+                    ,end_station_id = to_station_id
+                    ,member_casual = usertype
+ ))
# A tibble: 365,069 × 12
    ride_id started_at          ended_at            rideable_type tripduration
      <dbl> <dttm>              <dttm>                      <dbl>        <dbl>
 1 21742443 2019-01-01 00:04:37 2019-01-01 00:11:07          2167          390
 2 21742444 2019-01-01 00:08:13 2019-01-01 00:15:34          4386          441
 3 21742445 2019-01-01 00:13:23 2019-01-01 00:27:12          1524          829
 4 21742446 2019-01-01 00:13:45 2019-01-01 00:43:28           252         1783
 5 21742447 2019-01-01 00:14:52 2019-01-01 00:20:56          1170          364
 6 21742448 2019-01-01 00:15:33 2019-01-01 00:19:09          2437          216
 7 21742449 2019-01-01 00:16:06 2019-01-01 00:19:03          2708          177
 8 21742450 2019-01-01 00:18:41 2019-01-01 00:20:21          2796          100
 9 21742451 2019-01-01 00:18:43 2019-01-01 00:47:30          6205         1727
10 21742452 2019-01-01 00:19:18 2019-01-01 00:24:54          3939          336
# ℹ 365,059 more rows
# ℹ 7 more variables: start_station_id <dbl>, start_station_name <chr>,
#   end_station_id <dbl>, end_station_name <chr>, member_casual <chr>, gender <chr>,
#   birthyear <dbl>
# ℹ Use `print(n = ...)` to see more rows
>
```

Inspect the dataframes and look for incongruencies

str(q1_2019)
str(q1_2020)

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> str(q1_2019)
spc_tbl_ [365,069 × 12] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ ride_id           : num [1:365069] 21742443 21742444 21742445 21742446 21742447 ...
 $ started_at        : POSIXct[1:365069], format: "2019-01-01 00:04:37" "2019-01-01 00:08:13"
...
 $ ended_at          : POSIXct[1:365069], format: "2019-01-01 00:11:07" "2019-01-01 00:15:34"
...
 $ rideable_type     : num [1:365069] 2167 4386 1524 252 1170 ...
 $ tripduration      : num [1:365069] 390 441 829 1783 364 ...
 $ start_station_id  : num [1:365069] 199 44 15 123 173 98 98 211 150 268 ...
 $ start_station_name: chr [1:365069] "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine
Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ end_station_id    : num [1:365069] 84 624 644 176 35 49 49 142 148 141 ...
 $ end_station_name  : chr [1:365069] "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St
(*)" "Western Ave & Fillmore St (*)" "Clark St & Elm St" ...
 $ member_casual     : chr [1:365069] "Subscriber" "Subscriber" "Subscriber" "Subscriber" ...
 $ gender            : chr [1:365069] "Male" "Female" "Female" "Male" ...
 $ birthyear         : num [1:365069] 1989 1990 1994 1993 1994 ...
 - attr(*, "spec")=
  .. cols(
  ..   trip_id = col_double(),
  ..   start_time = col_datetime(format = ""),
  ..   end_time = col_datetime(format = ""),
  ..   bikeid = col_double(),
  ..   tripduration = col_number(),
  ..   from_station_id = col_double(),
  ..   from_station_name = col_character(),
  ..   to_station_id = col_double(),
  ..   to_station_name = col_character(),
  ..   usertype = col_character(),
  ..   gender = col_character(),
  ..   birthyear = col_double()
  .. )
 - attr(*, "problems")=<externalptr>
>
```

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> str(q1_2020)
spc_tbl_ [426,887 × 13] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
 $ ride_id           : chr [1:426887] "EACB19130B0CDA4A" "8FED874C809DC021" "789F3C21E472CA96"
"C9A388DAC6ABF313" ...
 $ rideable_type     : chr [1:426887] "docked_bike" "docked_bike" "docked_bike" "docked_bike"
...
 $ started_at        : POSIXct[1:426887], format: "2020-01-21 20:06:59" "2020-01-30 14:22:39"
...
 $ ended_at          : POSIXct[1:426887], format: "2020-01-21 20:14:30" "2020-01-30 14:26:22"
...
 $ start_station_name: chr [1:426887] "Western Ave & Leland Ave" "Clark St & Montrose Ave" "Broa
dway & Belmont Ave" "Clark St & Randolph St" ...
 $ start_station_id  : num [1:426887] 239 234 296 51 66 212 96 96 212 38 ...
 $ end_station_name  : chr [1:426887] "Clark St & Leland Ave" "Southport Ave & Irving Park Rd"
"Wilton Ave & Belmont Ave" "Fairbanks Ct & Grand Ave" ...
 $ end_station_id    : num [1:426887] 326 318 117 24 212 96 212 212 96 100 ...
 $ start_lat         : num [1:426887] 42 42 41.9 41.9 41.9 ...
 $ start_lng         : num [1:426887] -87.7 -87.7 -87.6 -87.6 -87.6 ...
 $ end_lat           : num [1:426887] 42 42 41.9 41.9 41.9 ...
 $ end_lng           : num [1:426887] -87.7 -87.7 -87.7 -87.6 -87.6 ...
 $ member_casual     : chr [1:426887] "member" "member" "member" "member" ...
 - attr(*, "spec")=
  .. cols(
  ..   ride_id = col_character(),
  ..   rideable_type = col_character(),
  ..   started_at = col_datetime(format = ""),
  ..   ended_at = col_datetime(format = ""),
  ..   start_station_name = col_character(),
  ..   start_station_id = col_double(),
  ..   end_station_name = col_character(),
  ..   end_station_id = col_double(),
  ..   start_lat = col_double(),
  ..   start_lng = col_double(),
  ..   end_lat = col_double(),
  ..   end_lng = col_double(),
  ..   member_casual = col_character()
  .. )
 - attr(*, "problems")=<externalptr>
>
```

Convert ride_id and rideable_type to character so that they can stack correctly

```
q1_2019 <-  mutate(q1_2019, ride_id = as.character(ride_id)
                  ,rideable_type = as.character(rideable_type))
```

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> q1_2019 <-  mutate(q1_2019, ride_id = as.character(ride_id)
+                   ,rideable_type = as.character(rideable_type))
> str(q1_2019)
tibble [365,069 × 12] (S3: tbl_df/tbl/data.frame)
 $ ride_id        : chr [1:365069] "21742443" "21742444" "21742445" "21742446" ...
 $ started_at     : POSIXct[1:365069], format: "2019-01-01 00:04:37" "2019-01-01 00:08:13"
...
 $ ended_at       : POSIXct[1:365069], format: "2019-01-01 00:11:07" "2019-01-01 00:15:34"
...
 $ rideable_type  : chr [1:365069] "2167" "4386" "1524" "252" ...
 $ tripduration   : num [1:365069] 390 441 829 1783 364 ...
 $ start_station_id  : num [1:365069] 199 44 15 123 173 98 98 211 150 268 ...
 $ start_station_name: chr [1:365069] "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine
Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ end_station_id    : num [1:365069] 84 624 644 176 35 49 49 142 148 141 ...
 $ end_station_name  : chr [1:365069] "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St
(*)" "Western Ave & Fillmore St (*)" "Clark St & Elm St" ...
 $ member_casual     : chr [1:365069] "Subscriber" "Subscriber" "Subscriber" "Subscriber" ...
 $ gender            : chr [1:365069] "Male" "Female" "Female" "Male" ...
 $ birthyear         : num [1:365069] 1989 1990 1994 1993 1994 ...
>
```

```
# Stack individual quarter's data frames into one big data frame

all_trips <- bind_rows(q1_2019, q1_2020)#, q3_2019)#, q4_2019, q1_2020


# Remove lat, long, birthyear, and gender fields as this data was dropped beginning in 2020

all_trips <- all_trips %>%
  select(-c(start_lat, start_lng, end_lat, end_lng, birthyear, gender,  "tripduration"))
```

Console | Terminal | Background Jobs

R 4.4.1 · ~/

```
> str(all_trips)
tibble [791,956 × 16] (S3: tbl_df/tbl/data.frame)
 $ ride_id           : chr [1:791956] "21742443" "21742444" "21742445" "21742446" ...
 $ started_at        : POSIXct[1:791956], format: "2019-01-01 00:04:37" "2019-01-01 00:08:13"
...
 $ ended_at          : POSIXct[1:791956], format: "2019-01-01 00:11:07" "2019-01-01 00:15:34"
...
 $ rideable_type     : chr [1:791956] "2167" "4386" "1524" "252" ...
 $ tripduration      : num [1:791956] 390 441 829 1783 364 ...
 $ start_station_id  : num [1:791956] 199 44 15 123 173 98 98 211 150 268 ...
 $ start_station_name: chr [1:791956] "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine
Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ end_station_id    : num [1:791956] 84 624 644 176 35 49 49 142 148 141 ...
 $ end_station_name  : chr [1:791956] "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St
(*)" "Western Ave & Fillmore St (*)" "Clark St & Elm St" ...
 $ member_casual     : chr [1:791956] "Subscriber" "Subscriber" "Subscriber" "Subscriber" ...
 $ gender            : chr [1:791956] "Male" "Female" "Female" "Male" ...
 $ birthyear         : num [1:791956] 1989 1990 1994 1993 1994 ...
 $ start_lat         : num [1:791956] NA NA NA NA NA NA NA NA NA NA ...
 $ start_lng         : num [1:791956] NA NA NA NA NA NA NA NA NA NA ...
 $ end_lat           : num [1:791956] NA NA NA NA NA NA NA NA NA NA ...
 $ end_lng           : num [1:791956] NA NA NA NA NA NA NA NA NA NA ...
> colnames(all_trips)
 [1] "ride_id"            "started_at"         "ended_at"           "rideable_type"
 [5] "tripduration"       "start_station_id"   "start_station_name" "end_station_id"
 [9] "end_station_name"   "member_casual"      "gender"             "birthyear"
[13] "start_lat"          "start_lng"          "end_lat"            "end_lng"
>
```

#==========
STEP 3: CLEAN UP AND ADD DATA TO PREPARE FOR ANALYSIS
#==========
Inspect the new table that has been created

colnames(all_trips) #List of column names

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> colnames(all_trips)
[1] "ride_id"            "started_at"         "ended_at"           "rideable_type"
[5] "start_station_id"   "start_station_name" "end_station_id"     "end_station_name"
[9] "member_casual"
>
```

nrow(all_trips) #How many rows are in data frame?

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> nrow(all_trips)  #How many rows are in data frame?
[1] 791956
>
```

dim(all_trips) #Dimensions of the data frame?

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> dim(all_trips)
[1] 791956      9
>
```

head(all_trips) #See the first 6 rows of data frame. Also tail(all_trips)

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> head(all_trips)
# A tibble: 6 × 9
  ride_id  started_at          ended_at            rideable_type start_station_id
  <chr>    <dttm>              <dttm>              <chr>                    <dbl>
1 21742443 2019-01-01 00:04:37 2019-01-01 00:11:07 2167                       199
2 21742444 2019-01-01 00:08:13 2019-01-01 00:15:34 4386                        44
3 21742445 2019-01-01 00:13:23 2019-01-01 00:27:12 1524                        15
4 21742446 2019-01-01 00:13:45 2019-01-01 00:43:28 252                        123
5 21742447 2019-01-01 00:14:52 2019-01-01 00:20:56 1170                       173
6 21742448 2019-01-01 00:15:33 2019-01-01 00:19:09 2437                        98
# ℹ 4 more variables: start_station_name <chr>, end_station_id <dbl>,
#   end_station_name <chr>, member_casual <chr>
>
```

str(all_trips) #See list of columns and data types (numeric, character, etc)

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> str(all_trips)
tibble [791,956 × 9] (S3: tbl_df/tbl/data.frame)
 $ ride_id           : chr [1:791956] "21742443" "21742444" "21742445" "21742446" ...
 $ started_at        : POSIXct[1:791956], format: "2019-01-01 00:04:37" "2019-01-01 00:08:13"
...
 $ ended_at          : POSIXct[1:791956], format: "2019-01-01 00:11:07" "2019-01-01 00:15:34"
...
 $ rideable_type     : chr [1:791956] "2167" "4386" "1524" "252" ...
 $ start_station_id  : num [1:791956] 199 44 15 123 173 98 98 211 150 268 ...
 $ start_station_name: chr [1:791956] "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine
Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ end_station_id    : num [1:791956] 84 624 644 176 35 49 49 142 148 141 ...
 $ end_station_name  : chr [1:791956] "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St
(*)" "Western Ave & Fillmore St (*)" "Clark St & Elm St" ...
 $ member_casual     : chr [1:791956] "Subscriber" "Subscriber" "Subscriber" "Subscriber" ...
>
```

summary(all_trips) #Statistical summary of data. Mainly for numerics

```
Console   Terminal ×   Background Jobs ×
R 4.4.1 · ~/
> summary(all_trips)
   ride_id            started_at                       ended_at
 Length:791956      Min.   :2019-01-01 00:04:37.00   Min.   :2019-01-01 00:11:07.00
 Class :character   1st Qu.:2019-02-28 17:04:04.75   1st Qu.:2019-02-28 17:15:58.75
 Mode  :character   Median :2020-01-07 12:48:50.50   Median :2020-01-07 13:02:50.00
                    Mean   :2019-09-01 11:58:08.35   Mean   :2019-09-01 12:17:52.17
                    3rd Qu.:2020-02-19 19:31:54.75   3rd Qu.:2020-02-19 19:51:54.50
                    Max.   :2020-03-31 23:51:34.00   Max.   :2020-05-19 20:10:34.00

 rideable_type      start_station_id start_station_name end_station_id  end_station_name
 Length:791956      Min.   :  2.0    Length:791956      Min.   :  2.0   Length:791956
 Class :character   1st Qu.: 77.0    Class :character   1st Qu.: 77.0   Class :character
 Mode  :character   Median :174.0    Mode  :character   Median :174.0   Mode  :character
                    Mean   :204.4                       Mean   :204.4
                    3rd Qu.:291.0                       3rd Qu.:291.0
                    Max.   :675.0                       Max.   :675.0
                                                        NA's   :1
 member_casual
 Length:791956
 Class :character
 Mode  :character

>
```

There are a few problems we will need to fix:
(1) In the "member_casual" column, there are two names for members ("member" and "Subscriber") and two names for casual riders ("Customer" and "casual"). We will need to consolidate that from four to two labels.
(2) The data can only be aggregated at the ride-level, which is too granular. We will want to add some additional columns of data -- such as day, month, year -- that provide additional opportunities to aggregate the data.
(3) We will want to add a calculated field for length of ride since the 2020Q1 data did not have the "tripduration" column. We will add "ride_length" to the entire dataframe for consistency.
(4) There are some rides where tripduration shows up as negative, including several hundred rides where Divvy took bikes out of circulation for Quality Control reasons. We will want to delete these rides.

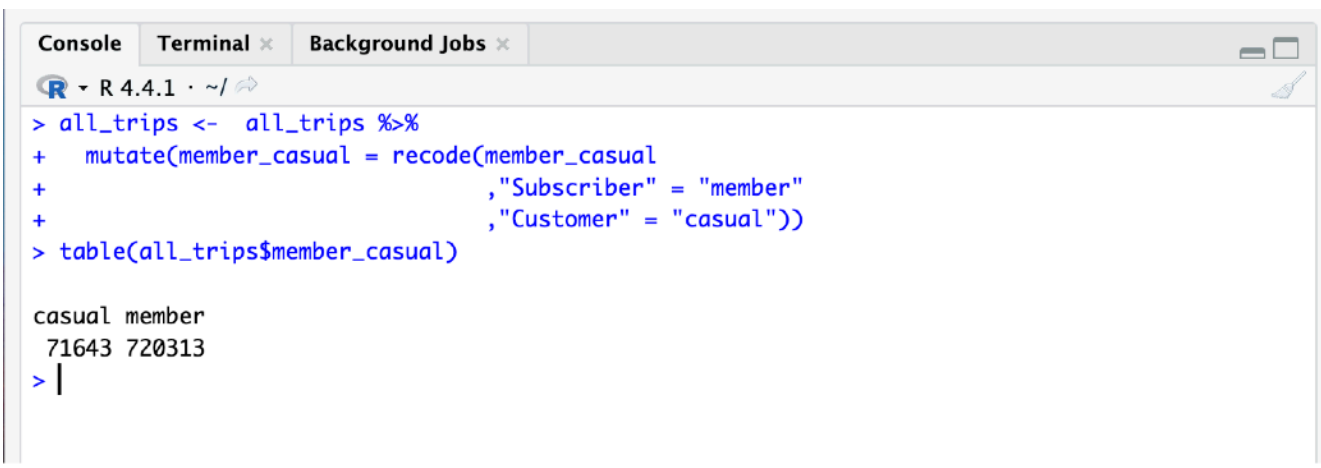
In the "member_casual" column, replace "Subscriber" with "member" and "Customer" with "casual"
Before 2020, Divvy used different labels for these two types of riders ... we will want to make our dataframe consistent with their current nomenclature
N.B.: "Level" is a special property of a column that is retained even if a subset does not contain any values from a specific level
Begin by seeing how many observations fall under each usertype table(all_trips$member_casual)

Reassign to the desired values (we will go with the current 2020 labels)

```
all_trips <-  all_trips %>%
  mutate(member_casual = recode(member_casual
                                ,"Subscriber" = "member"
                                ,"Customer" = "casual"))
```

Check to make sure the proper number of observations were reassigned

```
table(all_trips$member_casual)
```



Add columns that list the date, month, day, and year of each ride
This will allow us to aggregate ride data for each month, day, or year ... before completing these operations we could only aggregate at the ride level
https://www.statmethods.net/input/dates.html more on date formats in R found at that link

```
all_trips$date <- as.Date(all_trips$started_at) #The default format is yyyy-mm-dd
all_trips$month <- format(as.Date(all_trips$date), "%m")
all_trips$day <- format(as.Date(all_trips$date), "%d")
all_trips$year <- format(as.Date(all_trips$date), "%Y")
all_trips$day_of_week <- format(as.Date(all_trips$date), "%A")
```

Add a "ride_length" calculation to all_trips (in seconds)
https://stat.ethz.ch/R-manual/R-devel/library/base/html/difftime.html

all_trips$ride_length <- difftime(all_trips$ended_at,all_trips$started_at)

Inspect the structure of the columns

str(all_trips)

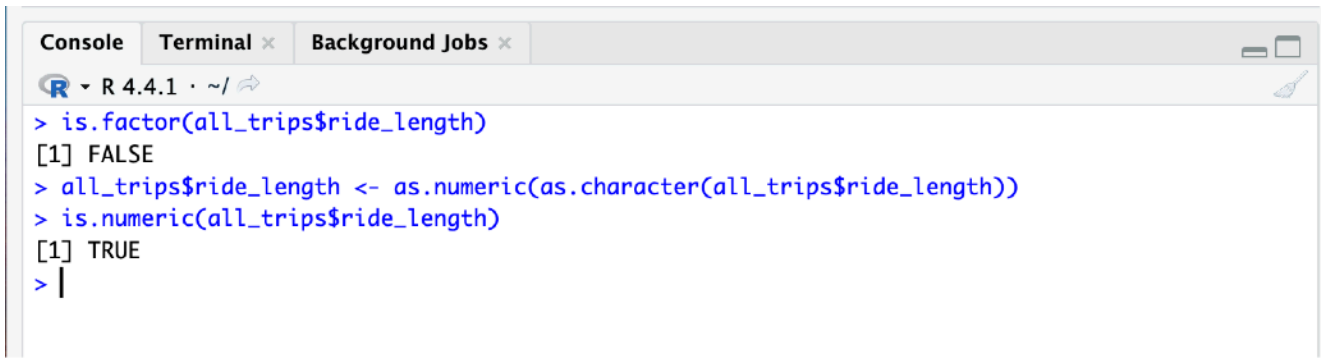
Console Terminal Background Jobs

R 4.4.1 · ~/

```
> all_trips$date <- as.Date(all_trips$started_at) #The default format is yyyy-mm-dd
> all_trips$month <- format(as.Date(all_trips$date), "%m")
> all_trips$day <- format(as.Date(all_trips$date), "%d")
> all_trips$year <- format(as.Date(all_trips$date), "%Y")
> all_trips$day_of_week <- format(as.Date(all_trips$date), "%A")
>
>
>
>
> all_trips$ride_length <- difftime(all_trips$ended_at,all_trips$started_at)
>
>
>
>
> str(all_trips)
tibble [791,956 × 15] (S3: tbl_df/tbl/data.frame)
 $ ride_id           : chr [1:791956] "21742443" "21742444" "21742445" "21742446" ...
 $ started_at        : POSIXct[1:791956], format: "2019-01-01 00:04:37" "2019-01-01 00:08:13"
...
 $ ended_at          : POSIXct[1:791956], format: "2019-01-01 00:11:07" "2019-01-01 00:15:34"
...
 $ rideable_type     : chr [1:791956] "2167" "4386" "1524" "252" ...
 $ start_station_id  : num [1:791956] 199 44 15 123 173 98 98 211 150 268 ...
 $ start_station_name: chr [1:791956] "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine
Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ end_station_id    : num [1:791956] 84 624 644 176 35 49 49 142 148 141 ...
 $ end_station_name  : chr [1:791956] "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St
(*)" "Western Ave & Fillmore St (*)" "Clark St & Elm St" ...
 $ member_casual     : chr [1:791956] "member" "member" "member" "member" ...
 $ date              : Date[1:791956], format: "2019-01-01" "2019-01-01" ...
 $ month             : chr [1:791956] "01" "01" "01" "01" ...
 $ day               : chr [1:791956] "01" "01" "01" "01" ...
 $ year              : chr [1:791956] "2019" "2019" "2019" "2019" ...
 $ day_of_week       : chr [1:791956] "Tuesday" "Tuesday" "Tuesday" "Tuesday" ...
 $ ride_length       : 'difftime' num [1:791956] 390 441 829 1783 ...
  ..- attr(*, "units")= chr "secs"
>
```

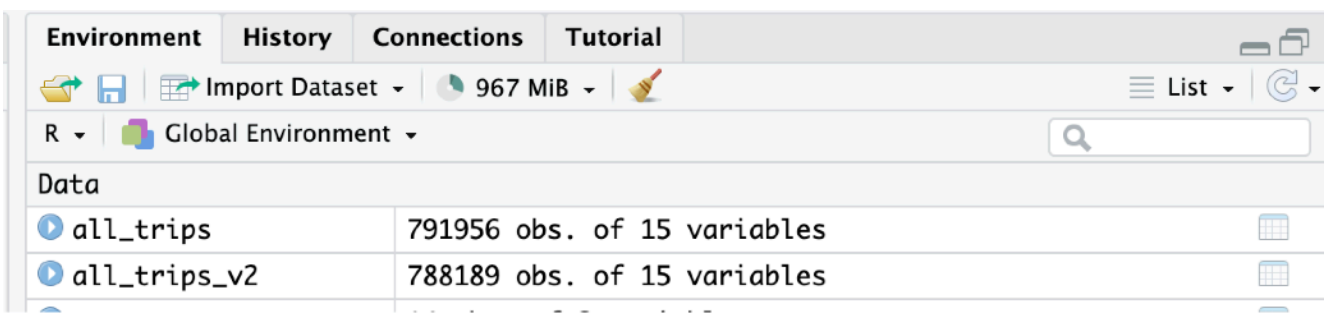
Convert "ride_length" from Factor to numeric so we can run calculations on the data

```
is.factor(all_trips$ride_length)
all_trips$ride_length <- as.numeric(as.character(all_trips$ride_length))
is.numeric(all_trips$ride_length)
```



Remove "bad" data
The dataframe includes a few hundred entries when bikes were taken out of docks and checked for quality by Divvy or ride_length was negative
We will create a new version of the dataframe (v2) since data is being removed
https://www.datasciencemadesimple.com/delete-or-drop-rows-in-r-with-conditions-2/

```
all_trips_v2 <- all_trips[!(all_trips$start_station_name == "HQ QR" | all_trips$ride_length<0),]
```



```
#=====================================
# STEP 4: CONDUCT DESCRIPTIVE ANALYSIS
#=====================================
# Descriptive analysis on ride_length (all figures in seconds)

mean(all_trips_v2$ride_length) #straight average (total ride length / rides)
median(all_trips_v2$ride_length) #midpoint number in the ascending array of ride lengths
max(all_trips_v2$ride_length) #longest ride
min(all_trips_v2$ride_length) #shortest ride
```

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> mean(all_trips_v2$ride_length)
[1] 1189.459
>
> median(all_trips_v2$ride_length)
[1] 539
>
> max(all_trips_v2$ride_length)
[1] 10632022
>
> min(all_trips_v2$ride_length)
[1] 1
>
```

```
# You can condense the four lines above to one line using summary() on the specific attribute

summary(all_trips_v2$ride_length)
```

Console Terminal Background Jobs

R 4.4.1 · ~/

```
> summary(all_trips_v2$ride_length)
    Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
       1      331      539     1189      912 10632022
>
```

Compare members and casual users

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = mean)
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = median)
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = max)
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = min)
```

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```
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = mean)
  all_trips_v2$member_casual all_trips_v2$ride_length
1                     casual                5372.7839
2                     member                 795.2523
>
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = median)
  all_trips_v2$member_casual all_trips_v2$ride_length
1                     casual                     1393
2                     member                      508
>
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = max)
  all_trips_v2$member_casual all_trips_v2$ride_length
1                     casual                 10632022
2                     member                  6096428
>
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = min)
  all_trips_v2$member_casual all_trips_v2$ride_length
1                     casual                        2
2                     member                        1
>
```

See the average ride time by each day for members vs casual users

aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual + all_trips_v2$day_of_week, FUN = mean)

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```
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual + all_trips_v2$day_of_week,
FUN = mean)
   all_trips_v2$member_casual all_trips_v2$day_of_week all_trips_v2$ride_length
1                      casual                   Friday                6090.7373
2                      member                   Friday                 796.7338
3                      casual                   Monday                4752.0504
4                      member                   Monday                 822.3112
5                      casual                 Saturday                4950.7708
6                      member                 Saturday                 974.0730
7                      casual                   Sunday                5061.3044
8                      member                   Sunday                 972.9383
9                      casual                 Thursday                8451.6669
10                     member                 Thursday                 707.2093
11                     casual                  Tuesday                4561.8039
12                     member                  Tuesday                 769.4416
13                     casual                Wednesday                4480.3724
14                     member                Wednesday                 711.9838
>
```

Notice that the days of the week are out of order. Let's fix that.

all_trips_v2$day_of_week <- ordered(all_trips_v2$day_of_week, levels=c("Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"))

Now, let's run the average ride time by each day for members vs casual users

aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual + all_trips_v2$day_of_week, FUN = mean)

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```
> all_trips_v2$day_of_week <- ordered(all_trips_v2$day_of_week, levels=c("Sunday", "Monday",
"Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"))
>
>
> aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual + all_trips_v2$day_of_week,
FUN = mean)
   all_trips_v2$member_casual all_trips_v2$day_of_week all_trips_v2$ride_length
1                      casual                   Sunday                5061.3044
2                      member                   Sunday                 972.9383
3                      casual                   Monday                4752.0504
4                      member                   Monday                 822.3112
5                      casual                  Tuesday                4561.8039
6                      member                  Tuesday                 769.4416
7                      casual                Wednesday                4480.3724
8                      member                Wednesday                 711.9838
9                      casual                 Thursday                8451.6669
10                     member                 Thursday                 707.2093
11                     casual                   Friday                6090.7373
12                     member                   Friday                 796.7338
13                     casual                 Saturday                4950.7708
14                     member                 Saturday                 974.0730
>
```

```
# analyze ridership data by type and weekday

all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%  #creates weekday field using wday()
      group_by(member_casual, weekday) %>%                #groups by usertype and weekday
      summarise(number_of_rides = n()            #calculates the number of rides and average duration
      ,average_duration = mean(ride_length)) %>%          # calculates the average duration
       arrange(member_casual, weekday)                    # sorts
```

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```
> all_trips_v2 %>%
+   mutate(weekday = wday(started_at, label = TRUE)) %>%
+   group_by(member_casual, weekday) %>%
+   summarise(number_of_rides = n()
+             ,average_duration = mean(ride_length)) %>%
+   arrange(member_casual, weekday)
`summarise()` has grouped output by 'member_casual'. You can override using the
`.groups` argument.
# A tibble: 14 × 4
# Groups:   member_casual [2]
   member_casual weekday number_of_rides average_duration
   <chr>         <ord>             <int>            <dbl>
 1 casual        Sun               18652            5061.
 2 casual        Mon                5591            4752.
 3 casual        Tue                7311            4562.
 4 casual        Wed                7690            4480.
 5 casual        Thu                7147            8452.
 6 casual        Fri                8013            6091.
 7 casual        Sat               13473            4951.
 8 member        Sun               60197             973.
 9 member        Mon              110430             822.
10 member        Tue              127974             769.
11 member        Wed              121902             712.
12 member        Thu              125228             707.
13 member        Fri              115168             797.
14 member        Sat               59413             974.
>
```

Let's visualize the number of rides by rider type

```
all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n()
            ,average_duration = mean(ride_length)) %>%
  arrange(member_casual, weekday)  %>%
  ggplot(aes(x = weekday, y = number_of_rides, fill = member_casual)) +
  geom_col(position = "dodge")
```

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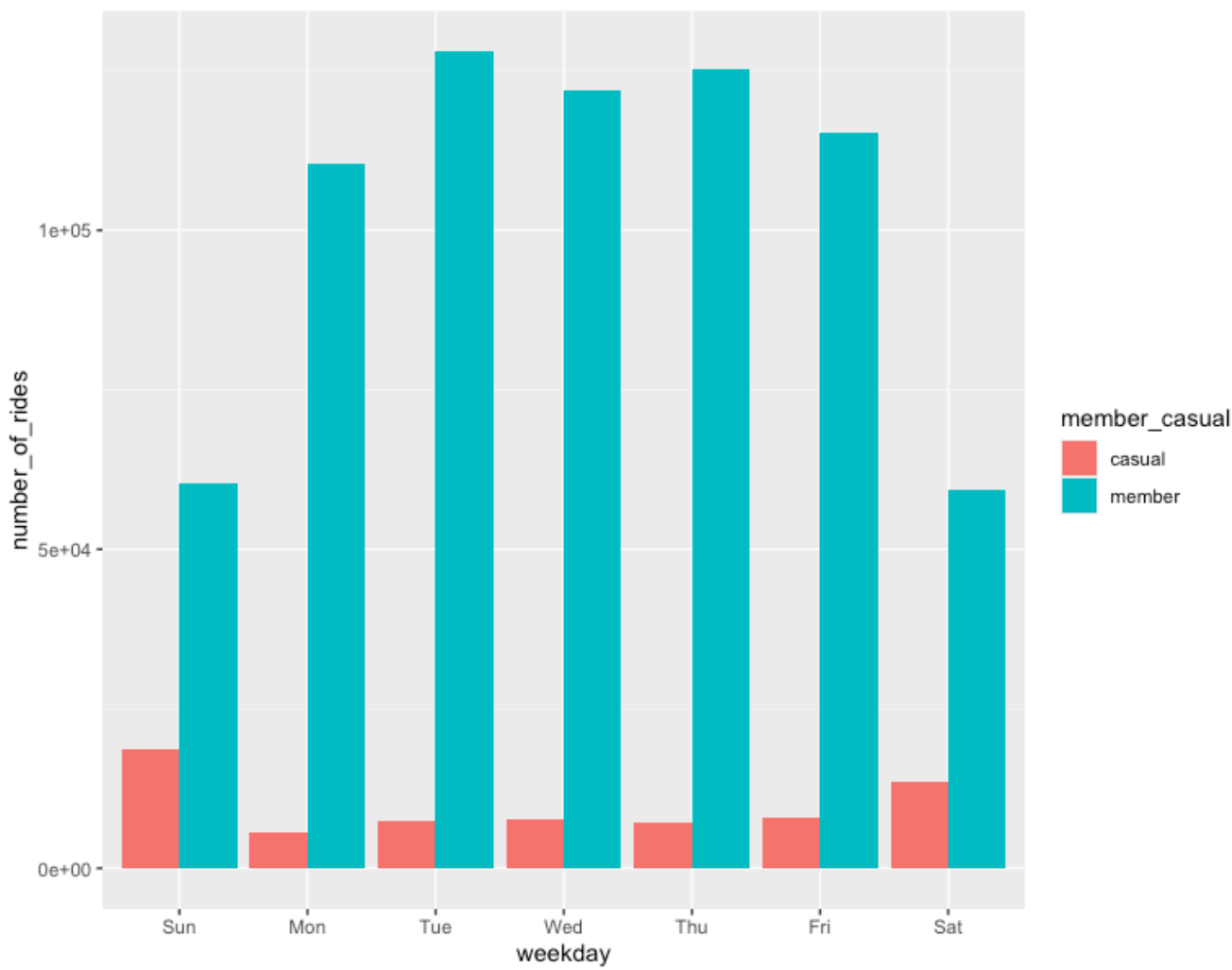
```
> all_trips_v2 %>%
+   mutate(weekday = wday(started_at, label = TRUE)) %>%
+   group_by(member_casual, weekday) %>%
+   summarise(number_of_rides = n()
+             ,average_duration = mean(ride_length)) %>%
+   arrange(member_casual, weekday)  %>%
+   ggplot(aes(x = weekday, y = number_of_rides, fill = member_casual)) +
+   geom_col(position = "dodge")
`summarise()` has grouped output by 'member_casual'. You can override using the
`.groups` argument.
>
```



Let's create a visualization for average duration

```
all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n()
            ,average_duration = mean(ride_length)) %>%
  arrange(member_casual, weekday)  %>%
  ggplot(aes(x = weekday, y = average_duration, fill = member_casual)) +
  geom_col(position = "dodge")
```

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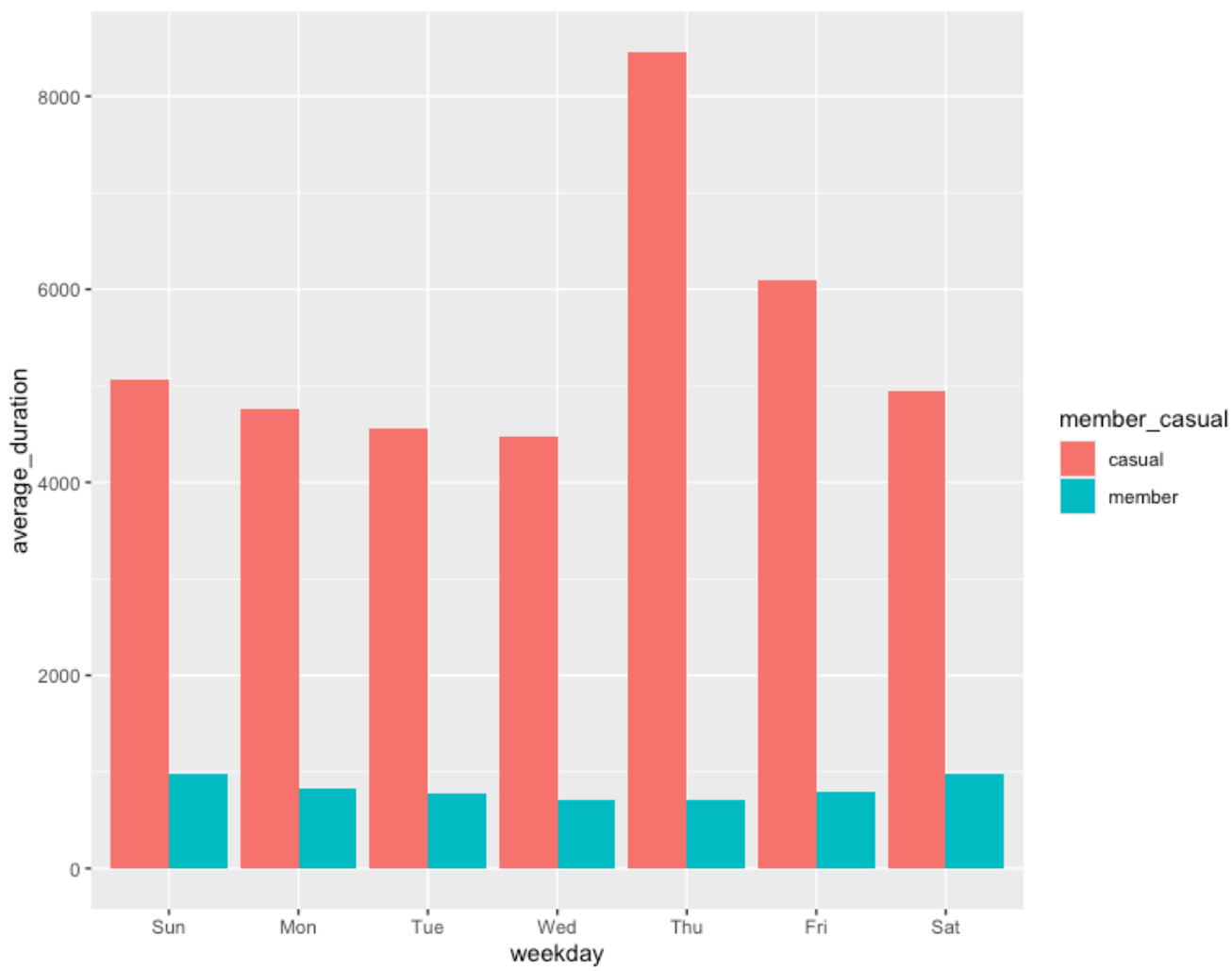
```
> all_trips_v2 %>%
+   mutate(weekday = wday(started_at, label = TRUE)) %>%
+   group_by(member_casual, weekday) %>%
+   summarise(number_of_rides = n()
+             ,average_duration = mean(ride_length)) %>%
+   arrange(member_casual, weekday)  %>%
+   ggplot(aes(x = weekday, y = average_duration, fill = member_casual)) +
+   geom_col(position = "dodge")
`summarise()` has grouped output by 'member_casual'. You can override using the
`.groups` argument.
>
```



```
#=====================================================
# STEP 5: EXPORT SUMMARY FILE FOR FURTHER ANALYSIS
#=====================================================
# Create a csv file that we will visualize in Excel, Tableau, or my presentation software
# N.B.: This file location is for a Mac. If you are working on a PC, change the file location accordingly
(most likely "C:\Users\YOUR_USERNAME\Desktop\...") to export the data. You can read more here:
https://datatofish.com/export-dataframe-to-csv-in-r/

counts <- aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual +
all_trips_v2$day_of_week, FUN = mean)

write.csv(counts, file = 'avg_ride_length.csv')
```