In [ ]:
```
###IMPORTING DATA

#> Tried importing data using boto3- But encountered no access error-4
04
    #Installed boto3 and tried importing boto3
    #s3 = boto3.resource('s3')
    #obj = s3.get_object(Bucket='tripdata', Key='tripdata/201701-citib
ike-tripdata.csv.zip')
    #df = pd.read_csv(io.BytesIO(obj['Body'].read()))

#> Then tried extracting data from url using glob.glob-to modify strin
g to match the right url for each file and
    #adding similar files to a list and appending the list and concate
nating the list but resulted in 0 files in list
    #Tried placing glob.glob (string modify) function in for loop, as
part of list ..etc

#> Then tried modifying url using simple variables and for loop but re
sulted in columns being duplicated

#> Then tried modifying url using simple variables- tospecify the mont
h in for loop specifying the header names
    #as header names had different spacing and cases in multiple files

#> Tried concatenating with axis=1, this adds to columns instead of ro
ws
```

In [2]:
```
import pandas as pd
import glob
import os

li = []

for i in range(1,13):
        j=str(i).zfill(2)
        df1 = pd.read_csv("https://s3.amazonaws.com/tripdata/2017"+j+"
-citibike-tripdata.csv.zip", index_col=None, header=0,names=['Trip Dur
ation', 'Start Time', 'Stop Time', 'Start Station ID',
       'Start Station Name', 'Start Station Latitude',
       'Start Station Longitude', 'End Station ID', 'End Station Name'
,
       'End Station Latitude', 'End Station Longitude', 'Bike ID', 'Us
er Type',
       'Birth Year', 'Gender'])
        li.append(df1)
        df2 = pd.read_csv("https://s3.amazonaws.com/tripdata/2018"+j+"
-citibike-tripdata.csv.zip", index_col=None, header=0,names=['Trip Dur
ation', 'Start Time', 'Stop Time', 'Start Station ID',
       'Start Station Name', 'Start Station Latitude',
       'Start Station Longitude', 'End Station ID', 'End Station Name'
,
       'End Station Latitude', 'End Station Longitude', 'Bike ID', 'Us
er Type',
       'Birth Year', 'Gender'])
        li.append(df2)
        if i!=2:
            df3 = pd.read_csv("https://s3.amazonaws.com/tripdata/2019"
+j+"-citibike-tripdata.csv.zip", index_col=None, header=0,names=['Trip
Duration', 'Start Time', 'Stop Time', 'Start Station ID',
           'Start Station Name', 'Start Station Latitude',
           'Start Station Longitude', 'End Station ID', 'End Station N
ame',
           'End Station Latitude', 'End Station Longitude', 'Bike ID',
'User Type',
           'Birth Year', 'Gender'])
            li.append(df3)
        if i<11 and i!=6:
            df4 = pd.read_csv("https://s3.amazonaws.com/tripdata/2020"
+j+"-citibike-tripdata.csv.zip", index_col=None, header=0,names=['Trip
Duration', 'Start Time', 'Stop Time', 'Start Station ID',
           'Start Station Name', 'Start Station Latitude',
           'Start Station Longitude', 'End Station ID', 'End Station N
ame',
           'End Station Latitude', 'End Station Longitude', 'Bike ID',
'User Type',
           'Birth Year', 'Gender'])
            li.append(df4)
df3 = pd.read_csv("/Users/vyshnavigovindankutty/Desktop/Bike Data/2019
02-citibike-tripdata.csv", index_col=None, header=0,names=['Trip Durat
ion', 'Start Time', 'Stop Time', 'Start Station ID',
           'Start Station Name', 'Start Station Latitude',
           'Start Station Longitude', 'End Station ID', 'End Station N
ame',
           'End Station Latitude', 'End Station Longitude', 'Bike ID',
'User Type',
           'Birth Year', 'Gender'])
li.append(df3)
df4 = pd.read_csv("/Users/vyshnavigovindankutty/Desktop/Bike Data/2020
06-citibike-tripdata.csv", index_col=None, header=0,names=['Trip Durat
ion', 'Start Time', 'Stop Time', 'Start Station ID',
           'Start Station Name', 'Start Station Latitude',
           'Start Station Longitude', 'End Station ID', 'End Station N
ame',
           'End Station Latitude', 'End Station Longitude', 'Bike ID',
'User Type',
           'Birth Year', 'Gender'])
li.append(df4)
```

In [3]:
```
df = pd.concat(li, axis=0, ignore_index=True)
df.head()
```

Out[3]:

| | Trip Duration | Start Time | Stop Time | Start Station ID | Start Station Name | Start Station Latitude | Start Station Longitude | End Station ID | End Station Name | L |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 680 | 2017-01-01 00:00:21 | 2017-01-01 00:11:41 | 3226.0 | W 82 St & Central Park West | 40.782750 | -73.971370 | 3165.0 | Central Park West & W 72 St | 40. |
| **1** | 1282 | 2017-01-01 00:00:45 | 2017-01-01 00:22:08 | 3263.0 | Cooper Square & E 7 St | 40.729236 | -73.990868 | 498.0 | Broadway & W 32 St | 40. |
| **2** | 648 | 2017-01-01 00:00:57 | 2017-01-01 00:11:46 | 3143.0 | 5 Ave & E 78 St | 40.776829 | -73.963888 | 3152.0 | 3 Ave & E 71 St | 40. |
| **3** | 631 | 2017-01-01 00:01:10 | 2017-01-01 00:11:42 | 3143.0 | 5 Ave & E 78 St | 40.776829 | -73.963888 | 3152.0 | 3 Ave & E 71 St | 40. |
| **4** | 621 | 2017-01-01 00:01:25 | 2017-01-01 00:11:47 | 3143.0 | 5 Ave & E 78 St | 40.776829 | -73.963888 | 3152.0 | 3 Ave & E 71 St | 40. |

In [4]:
```
##Function to implement data import

def import_data(df2,month,year):
    j=str(month).zfill(2)
    df1 = pd.read_csv("https://s3.amazonaws.com/tripdata/"+str(year)+j
+"-citibike-tripdata.csv.zip", index_col=None, header=0,names=['Trip D
uration', 'Start Time', 'Stop Time', 'Start Station ID',
    'Start Station Name', 'Start Station Latitude',
    'Start Station Longitude', 'End Station ID', 'End Station Name',
    'End Station Latitude', 'End Station Longitude', 'Bike ID', 'User
Type',
    'Birth Year', 'Gender'])
    df2=df2.append(df1,ignore_index=True)
    df2.head()
    return df2
```

In [5]:
```
df2=pd.DataFrame()
df2.head()
df2=import_data(df2,8,2019)
df2.head()
```

Out[5]:

| | Trip Duration | Start Time | Stop Time | Start Station ID | Start Station Name | Start Station Latitude | Start Station Longitude | End Station ID |
|---|---|---|---|---|---|---|---|---|
| **0** | 393 | 2019-08-01 00:00:01.4680 | 2019-08-01 00:06:35.3780 | 531.0 | Forsyth St & Broome St | 40.718939 | -73.992663 | 408.0 |
| **1** | 627 | 2019-08-01 00:00:01.9290 | 2019-08-01 00:10:29.7840 | 274.0 | Lafayette Ave & Fort Greene Pl | 40.686919 | -73.976682 | 3409.0 |
| **2** | 1132 | 2019-08-01 00:00:04.0480 | 2019-08-01 00:18:56.1650 | 2000.0 | Front St & Washington St | 40.702551 | -73.989402 | 3388.0 |
| **3** | 1780 | 2019-08-01 00:00:04.1630 | 2019-08-01 00:29:44.7940 | 479.0 | 9 Ave & W 45 St | 40.760193 | -73.991255 | 473.0 |
| **4** | 1517 | 2019-08-01 00:00:05.4580 | 2019-08-01 00:25:23.4550 | 3312.0 | 1 Ave & E 94 St | 40.781721 | -73.945940 | 3312.0 |

In [ ]:
```

```

In [ ]:
```
### DATA CLEANING
```

In [5]:
```
##1 Checked for duplicates in data

df[df.duplicated()].head()
```

Out[5]:

| Trip Duration | Start Time | Stop Time | Start Station ID | Start Station Name | Start Station Latitude | Start Station Longitude | End Station ID | End Station Name | End Station Latitude | St Long |
|---|---|---|---|---|---|---|---|---|---|---|

In [6]:
```
##2 Checked for null values in different columns

df[['User Type']].isnull().sum()
```

Out[6]:
```
User Type    15909
dtype: int64
```

In [7]:
```
##3 Checked for null values in both Start and Stop station for the sam
e row as they are important fields

df[['Start Station Latitude', 'Start Station Longitude']].isnull().all
(axis=1).sum()
```

Out[7]:
```
0
```

In [4]:
```
##4 Converted Start Time column to datetime datatype

df['Start Time']=pd.to_datetime(df['Start Time'])
```

In [ ]:
```

```

In [ ]:
```
###DATA ANALYSIS
```

In [ ]:
```
##1 What does the data mean to you?

Over the past decade, bicycle sharing systems have grown in number and
popularity in different cities,
especially New York. This lets users rent cycles for short trips and r
eturn them at the destination station. In this
project we perform exploratory analysis on bike share data to gain som
e insights on bike traffic, average trip duration, user types,
user characteristics .. etc
```

In [48]:
```
##2
    #>How has subscriber numbers changed from 2017 to 2018
df[(df['User Type']=='Subscriber')&(df['Start Time'].dt.year==2018)].g
roupby([df['Start Time'].dt.month,'User Type']).size().head()
```

Out[48]:
```
Start Time  User Type
2017        Subscriber    14579325
2018        Subscriber    15614825
2019        Subscriber    16782128
2020        Subscriber    11366053
dtype: int64
```

In [1]:
```
    #>How many bikes are in operation
df[~(df['Bike ID'].isnull())].nunique()
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent cal
l last)
<ipython-input-1-e8627cfd9ff0> in <module>
      1 #>How many bikes are in operation
----> 2 df[~(df['Bike ID'].isnull())].nunique()

NameError: name 'df' is not defined
```

In [42]:
```
    #>What is the most popular month in terms of number of trips, so t
hat we can provide some incentives on that
    #month
df.groupby([df['Start Time'].dt.year,df['Start Time'].dt.month]).size(
).head(24)
```

Out[42]:
```
Start Time  Start Time
2017        1              726676
            2              791647
            3              727665
            4             1315404
            5             1523268
            6             1731594
            7             1735599
            8             1816498
            9             1878098
            10            1897592
            11            1330649
            12             889967
2018        1              718994
            2              843114
            3              976672
            4             1307543
            5             1824710
            6             1953103
            7             1913625
            8             1977177
            9             1877884
            10            1878657
            11            1260355
            12            1016505
dtype: int64
```

In [47]:
```
    #> What is the busiest time during a day
df.groupby([df['Start Time'].dt.dayofweek,df['Start Time'].dt.hour]).s
ize().to_frame('Count').sort_values('Count',ascending=False).head(10)
```

Out[47]:

| | | **Count** |
|---|---|---|
| **Start Time** | **Start Time** | |
| **2** | **17** | 1097303 |
| | **18** | 1086364 |
| **1** | **18** | 1080738 |
| | **17** | 1075547 |
| **3** | **17** | 1054514 |
| | **18** | 1049078 |
| **0** | **17** | 1023918 |
| | **18** | 1019251 |
| **4** | **17** | 1011324 |
| **2** | **8** | 1007867 |

In [ ]:
```

```

In [ ]:
```
### QUESTIONS
```

In [72]:
```
##1  Which is the most popular station?

    #> First tried grouping by Start Station Name
        #then excluded null values
    #> Tried displaying max count value but station name corresponding 
to it was not getting displayed.
        #df[~(df['Start Station Name'].isnull())].groupby(df['Start 
Station Name']).size().to_frame('Count').max()

    #> Hence tried sorting values based on Count

df[~(df['Start Station Name'].isnull())].groupby(df['Start Station Nam
e']).size().to_frame('Count')
.sort_values('Count',ascending=False).head(1)
```

Out[72]:

| | Count |
|---|---|
| **Start Station Name** | |
| **Pershing Square North** | 534071 |

In [73]:
```
##2 What is the average distance that bikers ride?
import numpy as np

def haversine(lat1,lon1,lat2,lon2):
    lon1 = np.deg2rad(lon1)
    lat1 = np.deg2rad(lat1)
    lon2 = np.deg2rad(lon2)
    lat2 = np.deg2rad(lat2)

    dlon = lon2 - lon1
    dlat = lat2 - lat1
    a = np.sin(dlat/2)**2 + np.cos(lat1) * np.cos(lat2) * np.sin(dlon/
2)**2
    c = 2 * np.arcsin(np.sqrt(a))
    r_e = 6371
    return c * r_e


df['Distance'] = (haversine(df['Start Station Latitude'], df['Start St
ation Longitude'],
df['End Station Latitude'], df['End Station Longitude'])*0.621)

df['Distance'].mean()  # in miles
```

Out[73]:
```
1.1556939407943971
```

In [10]:
```
##3 What is the average trip duration?

(df['Trip Duration'].mean())/(60)    # in minutes
```

Out[10]:
```
17.834371498116045
```

In [15]:
```
##4 How many riders start and end their trip at the same station?

    #> Tried count function but it gave count for each column
    #> Tried size() but error- cannot call size() directly from datafr
ame, it can only be called after a groupby
    #> Then tried length of rows that satisfy the condition

len(df[(df['Start Station ID'].notnull())&(df['End Station ID'].notnul
l())&
(df['Start Station ID']==df['End Station ID'])])
```

Out[15]:
```
1741150
```

In [66]:
```
##5 What is the distribution of Customers to Subscribers?

    #> There were rows with Start Station Names that were temporarily
removed- checked for Station names containing
        #such temporarily removed names
        #df[df['Start Station Name'].astype(str).str.contains('tempora
rily removed')]
    #> Removed station names containing temporarily removed but divisi
on caused Nan values where column values
        #were Nan hence replaced them with 0
        #(df[~(df['Start Station Name'].astype(str).str.contains('temp
orarily removed')) & (df['User Type']=='Customer')]
        #.groupby(['Start Station Name']).size())/(df[~(df['Start Stat
ion Name'].astype(str).str.contains('temporarily removed'))& (df['User
Type']=='Subscriber')].groupby(['Start Station Name']).size()).replace
('NaN',0).head()
        #in places of NaN

(((df[~(df['Start Station Name'].astype(str).str.contains('temporarily
removed')) & (df['User Type']=='Customer')]
   .groupby(['Start Station Name']).size())/
     (df[~(df['Start Station Name'].astype(str).str.contains('temporar
ily removed'))& (df['User Type']=='Subscriber')]
      .groupby(['Start Station Name']).size())).replace('NaN',0).head(
)).to_frame('Count').sort_values('Count')
```

Out[66]:

| | Count |
|---|---|
| **Start Station Name** | |
| **1 Ave & E 30 St** | 0.069303 |
| **1 Ave & E 16 St** | 0.070881 |
| **1 Ave & E 18 St** | 0.088980 |
| **1 Ave & E 110 St** | 0.154909 |
| **1 Ave & E 39 St** | 0.264194 |

In [11]:
```
##6 What is the distribution of men and women?

((df[~(df['Start Station Name'].astype(str).str.contains('temporarily
removed')) & (df['Gender']==1)]
  .groupby(['Start Station Name']).size())/
     (df[~(df['Start Station Name'].astype(str).str.contains('temporar
ily removed'))& (df['Gender']==2)]
      .groupby(['Start Station Name']).size())).replace('NaN',0).head(
)
```

Out[11]:
```
Start Station Name
1 Ave & E 110 St    2.615739
1 Ave & E 16 St     2.610634
1 Ave & E 18 St     2.703881
1 Ave & E 30 St     2.800755
1 Ave & E 39 St     2.050451
dtype: float64
```

In [16]:
```
##7 What days of the week are most rides taken on?

    #>Tried group by dayofweek
    #df.groupby(pd.to_datetime(df['Start Time']).dt.dayofweek).size().
reset_index(name='Count')
        #.sort_values('Count',ascending=False)
    #> Then tried grouping by day_name()
df.groupby(df['Start Time'].dt.day_name()).size().to_frame('Count').so
rt_values('Count',ascending=False)
```

Out[16]:

| | Count |
|---|---|
| **Start Time** | |
| **Wednesday** | 10994964 |
| **Thursday** | 10648402 |
| **Tuesday** | 10636868 |
| **Friday** | 10412372 |
| **Monday** | 9933206 |
| **Saturday** | 9722146 |
| **Sunday** | 8797959 |

In [76]:
```
##8 Get top 10 bikeid by duration for each month in the first quarter
of 2019

    #> Tried implementing window function directly using Pandas, creat
ing a column rn with trip duration ranked in
        #descending order and to choose ranks<=10 and sort by month an
d year but error- Series' objects are mutable,
        #thus they cannot be hashed
        #(df.assign(rn=df.groupby(df['Start Time'].dt.year,df['Start T
ime'].dt.month)['Trip Duration'].rank(method='first', ascending=False)
).query('rn <= 10').sort_values([df['Start Time'].dt.year,df['Start Ti
me'].dt.month, 'rn']))

    #> This just displayed the ranks and not bike id
        #df[df['Start Time'].dt.year==2019].sort_values('rn').head()

    #> Created a column rank  to implement ranking like 'alias' in SQL
        #df['rn']=df.groupby([df['Start Time'].dt.year,df['Start Time'
].dt.month])['Trip Duration'].rank(ascending=False);

    #> Tried sorting values based on rank but did not work- error- gro
upby has no sort_values attribute
        #df[(df['Start Time'].dt.year==2019)].groupby([df['Start Time'
].dt.month])[['Start Time','rn']].sort_values(['rn']).head()

df['rn']=df.groupby([df['Start Time'].dt.year,df['Start Time'].dt.mont
h])['Trip Duration'].rank(ascending=False);
df[(df['Start Time'].dt.year==2019)&(df['Start Time'].dt.month<5)&(df[
'rn']<11)]
.groupby([df['Start Time'].dt.month]).head(10)
```

Out[76]:

| | Trip Duration | Start Time | Stop Time | Start Station ID | Start Station Name | Start Station Latitude | Start Station Longitude | St |
|---|---|---|---|---|---|---|---|---|
| **1465531** | 1371164 | 2019-01-01 19:57:47.094 | 2019-01-17 16:50:31.5930 | 456.0 | E 53 St & Madison Ave | 40.759711 | -73.974023 | : |
| **1701024** | 1792506 | 2019-01-08 16:57:51.880 | 2019-01-29 10:52:58.4820 | 3117.0 | Franklin St & Dupont St | 40.735640 | -73.958660 | 3( |
| **1747110** | 2679841 | 2019-01-09 17:14:05.549 | 2019-02-09 17:38:06.5610 | 3044.0 | Albany Ave & Fulton St | 40.680011 | -73.938475 | 3! |
| **1768433** | 2377708 | 2019-01-10 08:22:41.472 | 2019-02-06 20:51:10.3160 | 3152.0 | 3 Ave & E 71 St | 40.768737 | -73.961199 | 3: |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1832775** | 1702688 | 2019-01-11 22:06:10.539 | 2019-01-31 15:04:19.3930 | 3042.0 | Fulton St & Utica Ave | 40.679427 | -73.929891 | 3 |
| **1999371** | 1059371 | 2019-01-17 07:38:37.582 | 2019-01-29 13:54:48.8950 | 229.0 | Great Jones St | 40.727434 | -73.993790 | 3 |
| **2041870** | 1427844 | 2019-01-18 09:13:14.402 | 2019-02-03 21:50:38.6820 | 468.0 | Broadway & W 56 St | 40.765265 | -73.981923 | 3 |
| **2060370** | 1058966 | 2019-01-18 17:53:20.263 | 2019-01-31 00:02:47.1240 | 340.0 | Madison St & Clinton St | 40.712690 | -73.987763 | 3 |
| **2061005** | 1034663 | 2019-01-18 18:04:02.954 | 2019-01-30 17:28:26.3530 | 465.0 | Broadway & W 41 St | 40.755136 | -73.986580 | 3 |
| **2268207** | 1047413 | 2019-01-26 18:50:05.617 | 2019-02-07 21:46:59.3990 | 472.0 | E 32 St & Park Ave | 40.745712 | -73.981948 | 3 |
| **8228062** | 2571434 | 2019-03-04 17:23:10.667 | 2019-04-03 12:40:24.9710 | 2008.0 | Little West St & 1 Pl | 40.705693 | -74.016777 | 3 |
| **8301022** | 1461968 | 2019-03-06 17:54:46.547 | 2019-03-23 17:00:54.8470 | 3064.0 | Myrtle Ave & Lewis Ave | 40.696820 | -73.937569 | 3 |
| **8421451** | 2754673 | 2019-03-09 20:02:11.709 | 2019-04-10 18:13:25.5980 | 334.0 | W 20 St & 7 Ave | 40.742388 | -73.997262 | 2 |
| **8450905** | 2969781 | 2019-03-11 08:28:14.341 | 2019-04-14 17:24:35.5970 | 3358.0 | Garfield Pl & 8 Ave | 40.671198 | -73.974841 | 3 |
| **8883338** | 1339052 | 2019-03-19 20:47:04.806 | 2019-04-04 08:44:37.6620 | 3521.0 | Lenox Ave & W 111 St | 40.798786 | -73.952300 | 3 |
| **8942071** | 1908974 | 2019-03-20 23:21:50.400 | 2019-04-12 01:38:04.6990 | 3521.0 | Lenox Ave & W 111 St | 40.798786 | -73.952300 | 3 |
| **8952338** | 1630514 | 2019-03-21 12:21:26.469 | 2019-04-09 09:16:41.2680 | 504.0 | 1 Ave & E 16 St | 40.732219 | -73.981656 | 3 |
| **8986679** | 1797632 | 2019-03-22 17:46:16.709 | 2019-04-12 13:06:49.6490 | 3457.0 | E 58 St & Madison Ave | 40.763026 | -73.972095 | 4 |
| **9207436** | 1510516 | 2019-03-27 09:10:00.859 | 2019-04-13 20:45:17.5790 | 3427.0 | Lafayette St & Jersey St | 40.724305 | -73.996010 | 3 |
| **9312730** | 1334968 | 2019-03-29 07:30:19.837 | 2019-04-13 18:19:48.5680 | 361.0 | Allen St & Hester St | 40.716059 | -73.991908 | 3 |
| | | 2019-04-01 | 2019-04-26 | | Kent Ave & | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **13200795** | 2123501 | 18:58:27.387 | 08:50:08.6210 | 3016.0 | N 7 St | 40.720368 | -73.961651 | 3 |
| **13485990** | 2210301 | 2019-04-06 17:52:14.930 | 2019-05-02 07:50:36.5900 | 3584.0 | Eastern Pkwy & Franklin Ave | 40.670777 | -73.957680 | 3 |
| **13486136** | 2245318 | 2019-04-06 17:53:26.095 | 2019-05-02 17:35:24.3130 | 3584.0 | Eastern Pkwy & Franklin Ave | 40.670777 | -73.957680 | 3 |
| **13493510** | 2572595 | 2019-04-06 19:16:14.428 | 2019-05-06 13:52:50.3740 | 3364.0 | Carroll St & 5 Ave | 40.675162 | -73.981483 | |
| **13543432** | 2264557 | 2019-04-07 15:48:01.604 | 2019-05-03 20:50:38.9830 | 3042.0 | Fulton St & Utica Ave | 40.679427 | -73.929891 | 3 |
| **13549066** | 1891712 | 2019-04-07 16:44:46.529 | 2019-04-29 14:13:18.8950 | 3467.0 | W Broadway & Spring Street | 40.724947 | -74.001659 | 3 |
| **13558480** | 2330556 | 2019-04-07 18:39:27.501 | 2019-05-04 18:02:03.7510 | 3714.0 | Division Av & Hooper St | 40.706842 | -73.954435 | 3 |
| **13607798** | 1974452 | 2019-04-08 16:59:10.273 | 2019-05-01 13:26:42.6120 | 3498.0 | Pleasant Ave & E 120 St | 40.797477 | -73.931185 | 3 |
| **13733204** | 1964853 | 2019-04-10 14:59:25.995 | 2019-05-03 08:46:59.5460 | 3541.0 | Amsterdam Ave & W 125 St | 40.813358 | -73.956461 | 3 |
| **13752516** | 1952891 | 2019-04-10 18:20:48.647 | 2019-05-03 08:48:59.9510 | 533.0 | Broadway & W 38 St | 40.752996 | -73.987216 | 3 |
| **68330251** | 1947736 | 2019-02-01 12:51:51.503 | 2019-02-24 01:54:07.5690 | 458.0 | 11 Ave & W 27 St | 40.751396 | -74.005226 | 3 |
| **68417577** | 2403037 | 2019-02-04 13:25:32.159 | 2019-03-04 08:56:09.9670 | 224.0 | Spruce St & Nassau St | 40.711464 | -74.005524 | 3 |
| **68434115** | 1372092 | 2019-02-04 18:17:00.153 | 2019-02-20 15:25:12.4170 | 3691.0 | 28 Ave & 44 St | 40.764089 | -73.910651 | 3 |
| **68470677** | 1982217 | 2019-02-05 14:31:32.226 | 2019-02-28 13:08:29.8770 | 3518.0 | Lenox Ave & W 126 St | 40.808442 | -73.945209 | 3 |
| **68633473** | 1449369 | 2019-02-09 16:06:20.648 | 2019-02-26 10:42:30.2720 | 3505.0 | Lexington Ave & E 127 St | 40.805726 | -73.936322 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **68664706** | 1266532 | 2019-02-10 21:12:30.990 | 2019-02-25 13:01:23.9350 | 3629.0 | Adam Clayton Powell Blvd & W 126 St | 40.809495 | -73.947765 | 3 |
| **68679026** | 1303733 | 2019-02-11 10:43:05.169 | 2019-02-26 12:51:58.9290 | 498.0 | Broadway & W 32 St | 40.748549 | -73.988084 | 3 |
| **68681280** | 1383937 | 2019-02-11 12:22:09.131 | 2019-02-27 12:47:46.7190 | 364.0 | Lafayette Ave & Classon Ave | 40.689004 | -73.960239 | 3 |
| **68770030** | 1330980 | 2019-02-14 11:24:40.396 | 2019-03-01 21:07:40.8470 | 267.0 | Broadway & W 36 St | 40.750977 | -73.987654 | 3 |
| **68836095** | 1304306 | 2019-02-15 18:53:52.400 | 2019-03-02 21:12:19.3810 | 3046.0 | Marcus Garvey Blvd & Macon St | 40.682601 | -73.938037 | 3 |

In [14]:
```
##9 Get Station Name, latitude, longitude and number of bikes started
from each station using startstationid* for each day for the first qua
rter of 2019

    #> Error when groupby year-Grouper and axis must be same length
        #df[pd.DatetimeIndex(df['Start Time']).year==2019].groupby(['S
tart Station ID',pd.DatetimeIndex(df['Start Time']).date]).size().rese
t_index(name='Count')[['Start Station Name','Start Station Latitude','
Start Station Longitude','Start Station ID','Count']]

    #> Then tried including groupby(year) but error grouper and axis m
ust be same length
        #df[pd.DatetimeIndex(df['Start Time']).year==2019].groupby([pd
.DatetimeIndex(df['Start Time']).year,pd.DatetimeIndex(df['Start Time'
]).date]).agg('count').head()

    #> Would onlydisplay Start Station ID and no other value like sele
ct multiple columns in MySQL
        #df[df[pd.DatetimeIndex(df['Start Time']).year==2019]].groupby
([pd.DatetimeIndex(df['Start Time']).year,pd.DatetimeIndex(df['Start T
ime']).month]).size()


df[(df['Start Time'].dt.year==2019)&(df['Start Time'].dt.month<5)]
.groupby(['Start Station ID','Start Station Name','Start Station Latit
ude','Start Station Longitude',
df['Start Time'].dt.date]).size().head()
```

Out[14]:
```
Start Station ID  Start Station Name  Start Station Latitude  Start
Station Longitude  Start Time
72.0              W 52 St & 11 Ave    40.767272               -73.99
3929               2019-01-01    46

2019-01-02    43

2019-01-03    61

2019-01-04    74

2019-01-05    26
dtype: int64
```

In [6]:
```
##10 What is the average age of riders by gender?

    #> Tried getting mean by replacing nan values by 0 and by 2020 but
got key error as columns
        #had different number of values
        #df[2020-(df['Birth Year'])].groupby('Gender').replace('nan',0
).mean()
        #KeyError: "None of [Float64Index
    #> Checked if Birth Year had Nan values and tried to exclude those
but still got the same error
        #df1=df[~(df['Birth Year'].isnull())]
        #df1[2020-(df1['Birth Year'].apply(pd.to_numeric,errors='coerc
e'))].groupby('Gender').head()
    #> Then tried getting Birth Year and gender data step by step
        #df[['Birth Year','Gender']].head()
        #df[['Birth Year','Gender']].groupby('Gender').head()
        #df[['Birth Year','Gender']].groupby('Gender').mean()


(2020-(df[['Birth Year','Gender']].groupby('Gender').mean())).round(0)
.astype(int)
```

Out[6]:

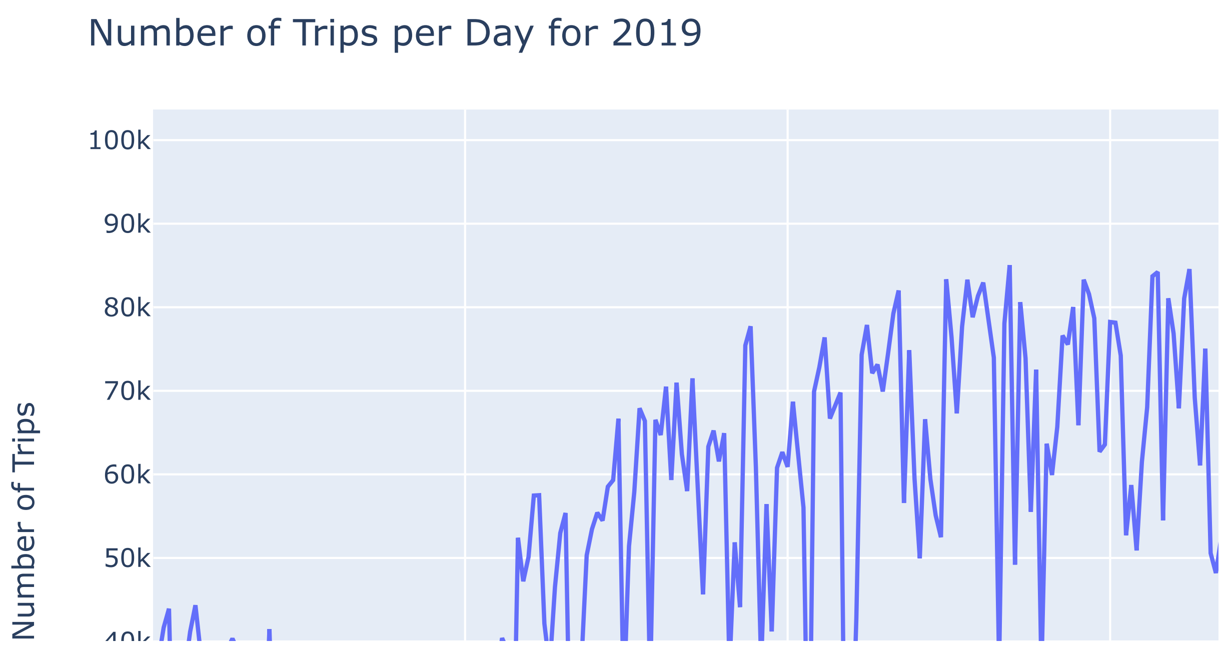
| | Birth Year |
|---|---|
| **Gender** | |
| **0** | 50 |
| **1** | 40 |
| **2** | 38 |

In [ ]:
```
```

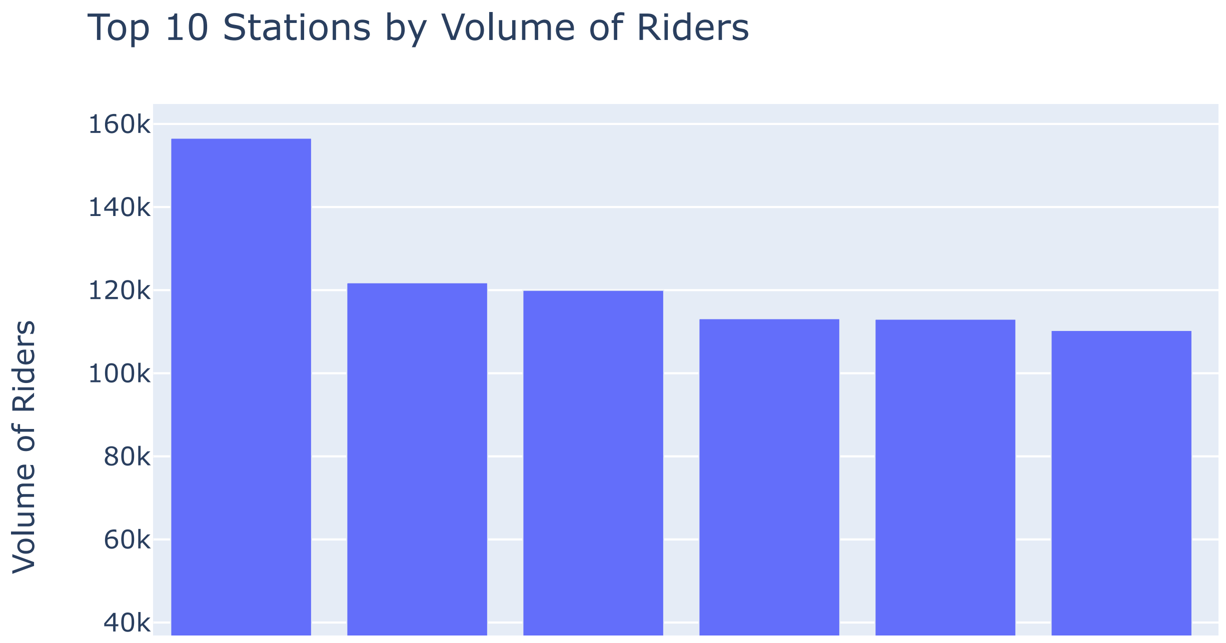
In [ ]:
```
#PLOTLY
```

In [ ]:
```
##1 Installed and imported plotly

import plotly.express as px
```

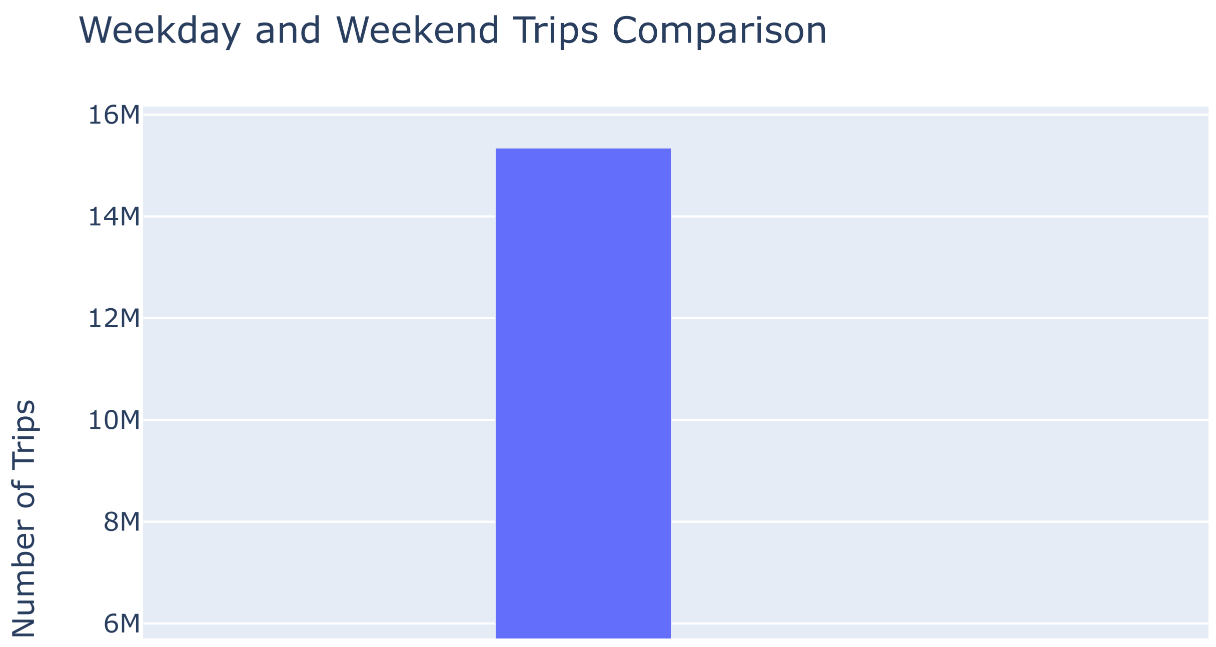
In [19]:
```
##2 Visualize the number of trips per day for 2019, grouped by month

    #> Tried executing the statement in Pandas
    #> Tried displaying only xaxis values and y axis values
    #> Tried groupby to get unique date values but it diaplyed the ent
ire table
    #> nunique function to get unique dates but gave only the total nu
mber of unique dates, in this case 306
    #> Then tried unique().head() to display unique dates but error
    #> Then tried unique() but gave datetime('date') format hence trie
d unique().tolist()
    #> Did not display months April,June so checked if those values we
re present

import plotly.express as px
xx=df[df['Start Time'].dt.year==2019]['Start Time'].dt.date.unique()
yy=df[df['Start Time'].dt.year==2019].groupby([df['Start Time'].dt.mon
th,df['Start Time'].dt.date]).size()
fig = px.line(df,x=xx,y=yy)
fig.update_layout(
    title="Number of Trips per Day for 2019",
    xaxis_title="Month of 2019",
    yaxis_title="Number of Trips")
fig.show()
```



In [7]:
```
##3 Visualize top 10 stations by volume of riders

import plotly.express as px
df1=df[df['Start Time'].dt.year==2019].groupby('Start Station Name').s
ize().to_frame('Count').sort_values('Count',ascending=False).head(10)
xx=df1.index.tolist()
yy=df1.Count

#df1.index.count()
fig = px.bar(x=xx,y=yy)
fig.update_layout(
    title="Top 10 Stations by Volume of Riders",
    xaxis_title="Station Name",
    yaxis_title="Volume of Riders")
fig.show()
```


Top 10 Stations by Volume of Riders
Volume of Riders
160k
140k
120k
100k
80k
60k
40k

In [18]:
```
##4 Visualize the imbalance between weekday and weekend trips

Weekday=(df[(df['Start Time'].dt.year==2019)&(df['Start Time'].dt.dayo
fweek<5)].groupby([df['Start Time'].dt.dayofweek]).size()).sum()
Weekend=(df[(df['Start Time'].dt.year==2019)&(df['Start Time'].dt.dayo
fweek>4)].groupby([df['Start Time'].dt.dayofweek]).size()).sum()
yy=[Weekday,Weekend]
xx=['Weekdays','Weekend']
fig = px.bar(x=xx,y=yy)
fig.update_layout(
    title="Weekday and Weekend Trips Comparison",
    xaxis_title="Day of the Week",
    yaxis_title="Number of Trips",bargap=.8)
fig.show()
```



In [ ]:

```
In [ ]:
```

```
In [ ]:
```