In [358]:
```
%matplotlib inline
import numpy as np
import pandas as pd
import plotly.graph_objs as go
from plotly import tools
import seaborn as sns
from plotly.offline import download_plotlyjs, init_notebook_mode, plot
, iplot
init_notebook_mode(connected=True)
```

Imports

In [359]:
```
df = pd.read_csv('/Users/jeffbloom13/WPI/DS504/week-7/201703-citibike-
tripdata.csv')
weatherDf = pd.read_csv('/Users/jeffbloom13/WPI/DS504/week-7/NYCWeathe
rClean.csv')
```

In [360]:
```
df.head(10)
```

Out[360]:

	Trip Duration	Start Time	Stop Time	Start Station ID	Start Station Name	Start Station Latitude	Start Station Longitude	End Station ID	End Station Name
0	1893	2017-03-01 00:00:32	2017-03-01 00:32:06	2009	Catherine St & Monroe St	40.711174	-73.996826	527	E 33 St & 2 Ave
1	223	2017-03-01 00:01:09	2017-03-01 00:04:53	127	Barrow St & Hudson St	40.731724	-74.006744	284	Greenwich Ave & 8 Ave
2	1665	2017-03-01 00:01:27	2017-03-01 00:29:12	174	E 25 St & 1 Ave	40.738177	-73.977387	307	Canal St & Rutgers St
3	100	2017-03-01 00:01:29	2017-03-01 00:03:10	316	Fulton St & William St	40.709560	-74.006536	306	Cliff St & Fulton St
4	1229	2017-03-01 00:01:33	2017-03-01 00:22:02	536	1 Ave & E 30 St	40.741444	-73.975361	259	South St & Whitehall St
5	613	2017-03-01 00:01:57	2017-03-01 00:12:11	259	South St & Whitehall St	40.701221	-74.012342	276	Duane St & Greenwich St
6	157	2017-03-01 00:02:12	2017-03-01 00:04:49	3329	Degraw St & Smith St	40.682915	-73.993182	3384	Smith St & 3 St
7	233	2017-03-01 00:02:15	2017-03-01 00:06:08	3107	Bedford Ave & Nassau Ave	40.723117	-73.952123	3090	N 8 St & Driggs Ave
8	317	2017-03-01 00:02:38	2017-03-01 00:07:55	3328	W 100 St & Manhattan Ave	40.795000	-73.964500	3285	W 87 St & Amsterdam Ave
9	2042	2017-03-01 00:02:54	2017-03-01 00:36:57	128	MacDougal St & Prince St	40.727103	-74.002971	3289	W 90 St & Amsterdam Ave

Clean data

In [361]:
```
df.isna().sum()
```

Out[361]:
```
Trip Duration                0
Start Time                   0
Stop Time                    0
Start Station ID             0
Start Station Name           0
Start Station Latitude       0
Start Station Longitude      0
End Station ID               0
End Station Name             0
End Station Latitude         0
End Station Longitude        0
Bike ID                      0
User Type                 5136
Birth Year               32846
Gender                       0
dtype: int64
```

In [362]:
```
df_wo_na = df.dropna()
```

In [363]:
```
df['Birth Year'].apply(lambda y: y + 100 if y < 1918 else y)
df = df.reset_index(drop=True)
```

In [364]:
```
from sklearn import neighbors
knn = neighbors.KNeighborsRegressor(10, weights='distance')
for col in ['Start Time', 'Stop Time']:
    df_wo_na[col] = df_wo_na[col].apply(lambda x: pd.Timestamp(x).valu
e)
for col in ['Start Station Name', 'End Station Name', 'User Type']:
    df_wo_na[col] = pd.Categorical(df_wo_na[col]).codes
knn.fit(df_wo_na.drop(['Birth Year'], axis=1).values, df_wo_na['Birth
Year'].values)
```

Out[364]:
```
KNeighborsRegressor(algorithm='auto', leaf_size=30, metric='minkowsk
i',
                    metric_params=None, n_jobs=None, n_neighbors=10,
p=2,
                    weights='distance')
```

In [365]:
```
nan_by = df[df['Birth Year'].isnull()]
for col in ['Start Time', 'Stop Time']:
    nan_by[col] = nan_by[col].apply(lambda x: pd.Timestamp(x).value)
for col in ['Start Station Name', 'End Station Name', 'User Type']:
    nan_by[col] = pd.Categorical(nan_by[col]).codes
nan_by = nan_by.drop(['Birth Year'], axis=1)
nan_by['Birth Year'] = knn.predict(nan_by)
df.loc[df['Birth Year'].isnull(), 'Birth Year'] = nan_by['Birth Year']
.astype(int)
df['age'] = df['Birth Year'].apply(lambda y: 2017 - y)
```

```
/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:3:
SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pand
as-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
py

/opt/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:5:
SettingWithCopyWarning:


A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pand
as-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-co
py
```

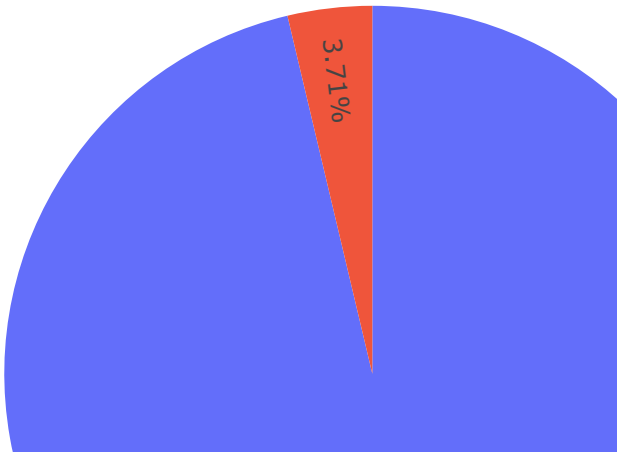
In [366]:
```
df.isna().sum()
df = df.dropna()
df.isna().sum()
```

Out[366]:
```
Trip Duration             0
Start Time                0
Stop Time                 0
Start Station ID          0
Start Station Name        0
Start Station Latitude    0
Start Station Longitude   0
End Station ID            0
End Station Name          0
End Station Latitude      0
End Station Longitude     0
Bike ID                   0
User Type                 0
Birth Year                0
Gender                    0
age                       0
dtype: int64
```

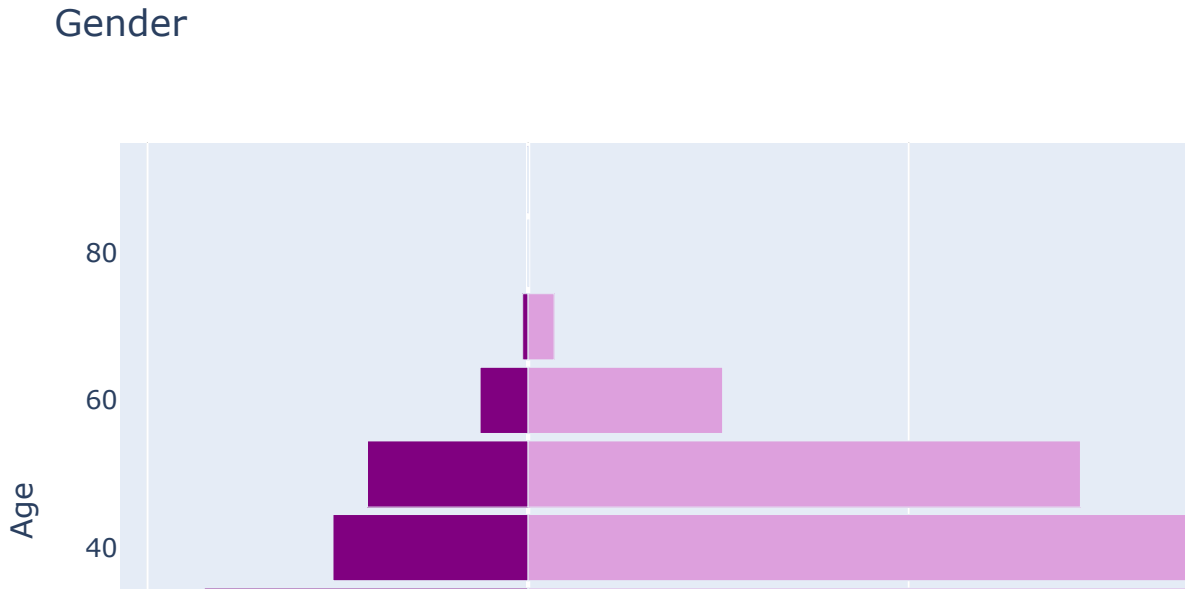
In [367]:
```
customer_type_df = pd.DataFrame(data=df['User Type'].value_counts())
customer_type_df = customer_type_df.reset_index()
customer_type_df.rename(columns={'User Type':'count', 'index': 'type'}
, inplace=True)
```

In [368]:
```
layout = go.Layout(
    title='User Type',
)
trace = go.Pie(labels=customer_type_df['type'].values, values=customer
_type_df['count'].values)
fig = go.Figure(data=[trace], layout=layout)
iplot(fig)
```

User Type



In [369]:
```
y = list(range(0, 110, 10))
men_bins = []
women_bins = []
for i in range(0, len(y) - 1):
    df_gender = pd.DataFrame(data=df[( df['age'] >  y[i] ) & (df['age'
] < y[i+1]) ]['Gender'].value_counts())
    df_gender = df_gender.reset_index()
    df_gender.rename(columns={'Gender':'count', 'index':'gender'}, inp
lace=True)
    count = df_gender[df_gender['gender'] == 1]['count']
    men_bins.append(0 if len(count) == 0 else count.values[0])
    count2 = df_gender[df_gender['gender'] == 2]['count']
    women_bins.append(0 if len(count2) == 0 else -count2.values[0])

layout = go.Layout(yaxis=go.layout.YAxis(title='Age'),
                   title="Gender",
                    barmode='overlay',
                    bargap=0.1)

data = [
        go.Bar(y=y,
               x=women_bins,
               orientation='h',
               name='Women',
               text=-1 * women_bins,
               hoverinfo='text',
               marker=dict(color='purple')
               ),go.Bar(y=y,
               x=men_bins,
               orientation='h',
               name='Men',
               hoverinfo='x',
               marker=dict(color='plum')
               )]
iplot(dict(data=data, layout=layout))
```



In [370]:
```
df['Start Time'] = df['Start Time'].apply(pd.to_datetime)
def extract_part_of_day(hour):
    if hour < 4:
        return 'early morning'
    if hour < 10:
        return 'morning'
    if hour < 14:
        return 'noon'
    if hour < 18:
        return 'afternoon'
    return 'evening'
df['part_of_day'] = df['Start Time'].apply(lambda t: extract_part_of_d
ay(t.hour))
```

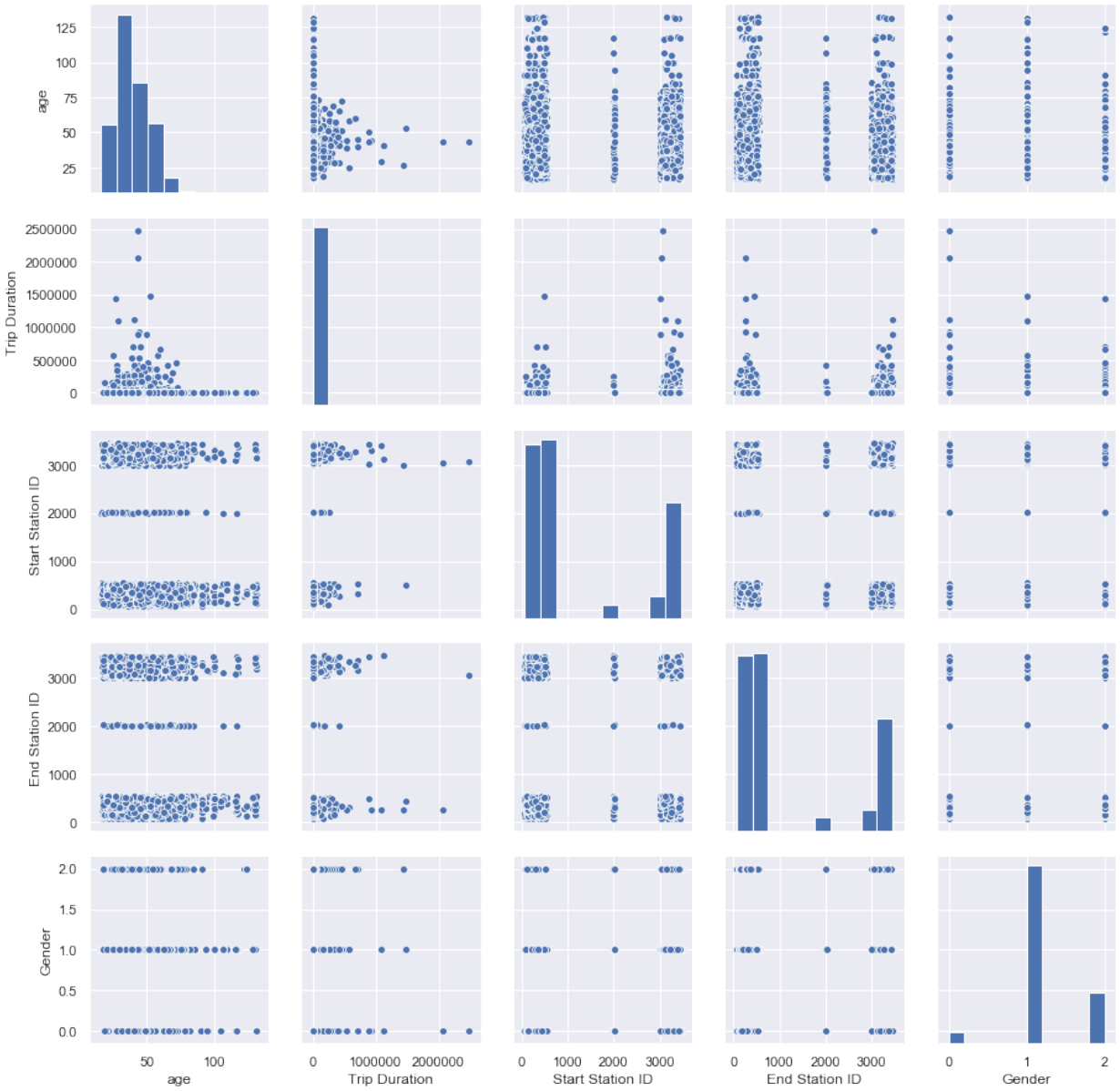
In [371]:
```
df_station_end = df.groupby(['End Station ID', 'End Station Name', 'End Station Latitude', 'End Station Longitude']).count().reset_index()[['End Station ID', 'End Station Name', 'End Station Latitude', 'End Station Longitude', 'age']]
df_station_end.rename(columns={
    'End Station ID': 'id',
    'End Station Name': 'name',
    'End Station Latitude':'lat',
    'End Station Longitude': 'lon'
}, inplace= True)
df_station_start = df.groupby(['Start Station ID', 'Start Station Name', 'Start Station Latitude', 'Start Station Longitude']).count().reset_index()[['Start Station ID', 'Start Station Name', 'Start Station Latitude', 'Start Station Longitude', 'age']]
df_station_start.rename(columns={
    'Start Station ID': 'id',
    'Start Station Name': 'name',
    'Start Station Latitude':'lat',
    'Start Station Longitude': 'lon'
}, inplace= True)

df_paths = df.groupby(['End Station ID', 'End Station Name', 'End Station Latitude', 'End Station Longitude','Start Station ID', 'Start Station Name', 'Start Station Latitude', 'Start Station Longitude']).count().reset_index()
```

In [372]:
```
mapbox_access_token = 'pk.eyJ1Ijoiam1ibG9vbSIsImEiOiJja2Y1cm1maHUwYjNn
MnBxN3pqcGZqNjd4In0.7r3hp8Vj1efich43hkUaDQ'


data = []
data.append(go.Scattermapbox(
        lat=df_station_start['lat'].values,
        lon=df_station_start['lon'].values,
        mode='markers',
        marker=dict(
                size=9
        ),
         text=df_station_start['name'].values
    ))
for i in range(len(df_paths)//2 - 1, len(df_paths)//2-100, -1):
     data.append(go.Scattermapbox(
        lat=[df_paths['Start Station Latitude'][i], df_paths['End Stat
ion Latitude'][i]],
        lon=[ df_paths['Start Station Longitude'][i], df_paths['End St
ation Longitude'][i]],
        mode='lines',
        line = dict(
                width = 1,
                color = 'red',
            ),
    ))
layout = go.Layout(
    autosize=True,
    hovermode='closest',
    mapbox=dict(
        accesstoken=mapbox_access_token,
        bearing=0,
        center=dict(
            lat=40.76,
            lon=-73.99
        ),
        pitch=0,
        zoom=12
    ),
    showlegend = False
)


fig = dict(data=data, layout=layout)
iplot(fig, filename='Multiple Mapbox')
```

(https://www.mapbox.com/)

In [373]:
```
sns.pairplot(df[['age','Trip Duration', 'Start Station ID', 'End Station ID','Gender']])
```

Out[373]: <seaborn.axisgrid.PairGrid at 0x7fcb10b8c690>



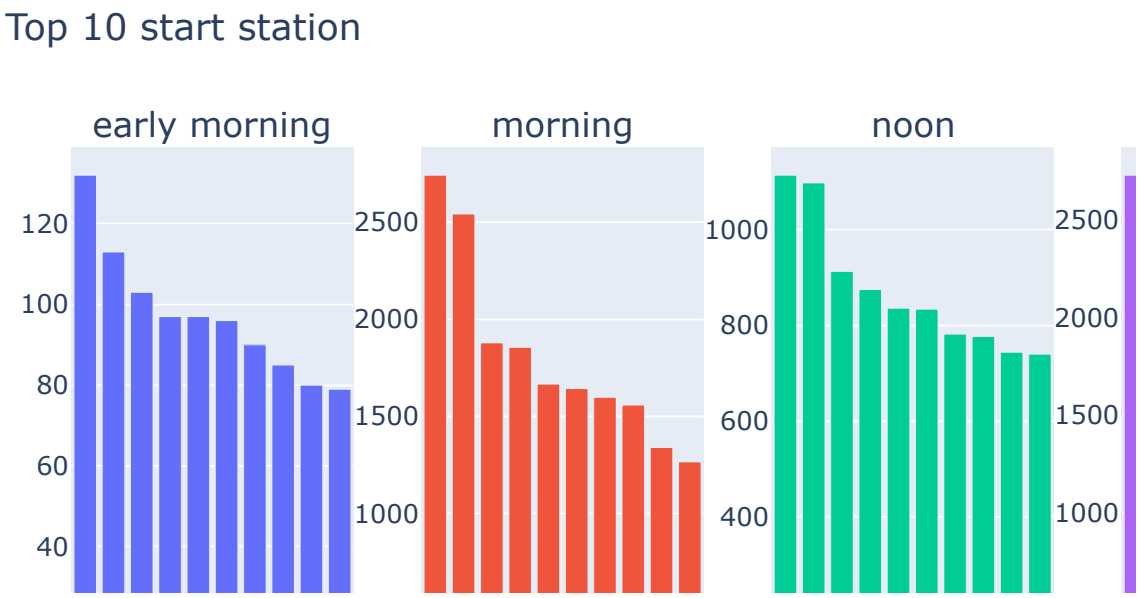
In [374]:
```
df.head(5)
```

Out[374]:

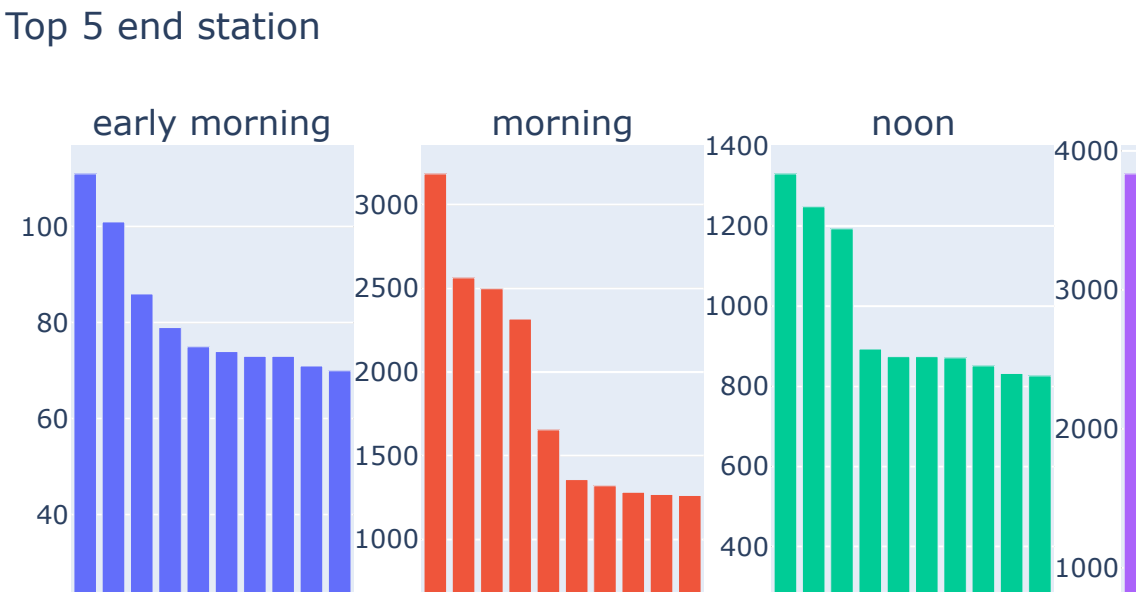
	Trip Duration	Start Time	Stop Time	Start Station ID	Start Station Name	Start Station Latitude	Start Station Longitude	End Station ID	End Station Name
0	1893	2017-03-01 00:00:32	2017-03-01 00:32:06	2009	Catherine St & Monroe St	40.711174	-73.996826	527	E 33 St & 2 Ave
1	223	2017-03-01 00:01:09	2017-03-01 00:04:53	127	Barrow St & Hudson St	40.731724	-74.006744	284	Greenwich Ave & 8 Ave
2	1665	2017-03-01 00:01:27	2017-03-01 00:29:12	174	E 25 St & 1 Ave	40.738177	-73.977387	307	Canal St & Rutgers St
3	100	2017-03-01 00:01:29	2017-03-01 00:03:10	316	Fulton St & William St	40.709560	-74.006536	306	Cliff St & Fulton St
4	1229	2017-03-01 00:01:33	2017-03-01 00:22:02	536	1 Ave & E 30 St	40.741444	-73.975361	259	South St & Whitehall St

In [375]:
```
day_parts = ['early morning','morning', 'noon', 'afternoon','evening']
fig = tools.make_subplots(rows=1, cols=5, subplot_titles=day_parts)

df_station_end = df.groupby(['End Station ID', 'End Station Name', 'En
d Station Latitude', 'End Station Longitude','part_of_day']).count().r
eset_index()[['End Station ID', 'End Station Name', 'End Station Latit
ude', 'End Station Longitude', 'age','part_of_day']]
df_station_end.rename(columns={
    'End Station ID': 'id',
    'End Station Name': 'name',
    'End Station Latitude':'lat',
    'End Station Longitude': 'lon'
}, inplace= True)
df_station_start = df.groupby(['Start Station ID', 'Start Station Name
', 'Start Station Latitude', 'Start Station Longitude','part_of_day'])
.count().reset_index()[['Start Station ID', 'Start Station Name', 'Sta
rt Station Latitude', 'Start Station Longitude', 'age','part_of_day']]
df_station_start.rename(columns={
    'Start Station ID': 'id',
    'Start Station Name': 'name',
    'Start Station Latitude':'lat',
    'Start Station Longitude': 'lon'
}, inplace= True)


for idx, daypart in enumerate(day_parts):
    df_start_top10 = df_station_start[df_station_start['part_of_day']
== daypart].sort_values(['age'], ascending=False).head(10)
    trace = go.Bar(
            x=df_start_top10.name,
            y=df_start_top10.age
    )
    fig.append_trace(trace, 1, idx + 1)

fig['layout'].update(title='Top 10 start station')

iplot(fig)
```

```
/opt/anaconda3/lib/python3.7/site-packages/plotly/tools.py:465: Depr
ecationWarning:

plotly.tools.make_subplots is deprecated, please use plotly.subplots
.make_subplots instead
```



In [376]:
```
fig2 = tools.make_subplots(rows=1, cols=5, subplot_titles=day_parts)
for idx, daypart in enumerate(day_parts):
    df_start_top10 = df_station_end[df_station_end['part_of_day'] == d
aypart].sort_values(['age'], ascending=False).head(10)
    trace = go.Bar(
            x=df_start_top10.name,
            y=df_start_top10.age
    )
    fig2.append_trace(trace, 1, idx + 1)

fig2['layout'].update(title='Top 5 end station')

iplot(fig2)
```



In [377]:
```
#df.index = df['Start Time']
#countsPerDay = df['Start Time'].resample('D', how = ['count'])

df.index = df['Start Time'] # Set 'starttime' variable as the index
#countsPerDay = df['Start Time'].resample('D', how = ['count'])
countsPerDay = df['Start Time'].resample('D').count()
```

In [378]:
```
countsPerDay.values
#countsPerDay.head()
```

Out[378]:
```
array([40401, 35517, 30927, 15498, 15760, 32344, 29574, 43172, 44866
,
       18351, 15060, 13357, 27303,     0,     0,     0,  7029,  4073
,
       10397, 27269, 36611, 26806, 29716, 33824, 28948, 19603, 26166
,
       21493, 42157, 39375,  6932])
```

In [379]:
```
ndim = countsPerDay.shape[0]
ndim
```

Out[379]:
```
31
```

In [380]:
```
# Now add count
weatherDf['count'] = 0
ndim = countsPerDay.shape[0]
for index,row in weatherDf.iterrows():
    #print('colNum=', i)
    #print('val=', df2.iloc[: , idx].values)
    #print('day=',j['Day'])

    print(row['Day'], row['P'])
    #row['count'] = countsPerDay['count'].values[index]
    if index < ndim:
        print('count=', countsPerDay.values[index])
       # df['count'][index] = countsPerDay['count'].values[index]
        weatherDf.loc[index,'count'] = countsPerDay.values[index]
```

```
1.0 0.0
count= 40401
2.0 0.12
count= 35517
3.0 0.0
count= 30927
4.0 0.0
count= 15498
5.0 0.0
count= 15760
```

```
6.0 0.0
count= 32344
7.0 0.0
count= 29574
8.0 0.16
count= 43172
9.0 0.0
count= 44866
10.0 0.0
count= 18351
11.0 0.24
count= 15060
12.0 0.0
count= 13357
13.0 0.0
count= 27303
14.0 0.32
count= 0
15.0 0.71
count= 0
16.0 0.0
count= 0
17.0 0.0
count= 7029
18.0 0.0
count= 4073
19.0 0.07
count= 10397
20.0 0.0
count= 27269
21.0 0.0
count= 36611
22.0 0.0
count= 26806
23.0 0.0
count= 29716
24.0 0.0
count= 33824
25.0 0.0
count= 28948
26.0 0.1
count= 19603
27.0 0.02
count= 26166
28.0 0.42
count= 21493
29.0 0.43
count= 42157
30.0 0.0
count= 39375
```

```
31.0 0.33
count= 6932
```

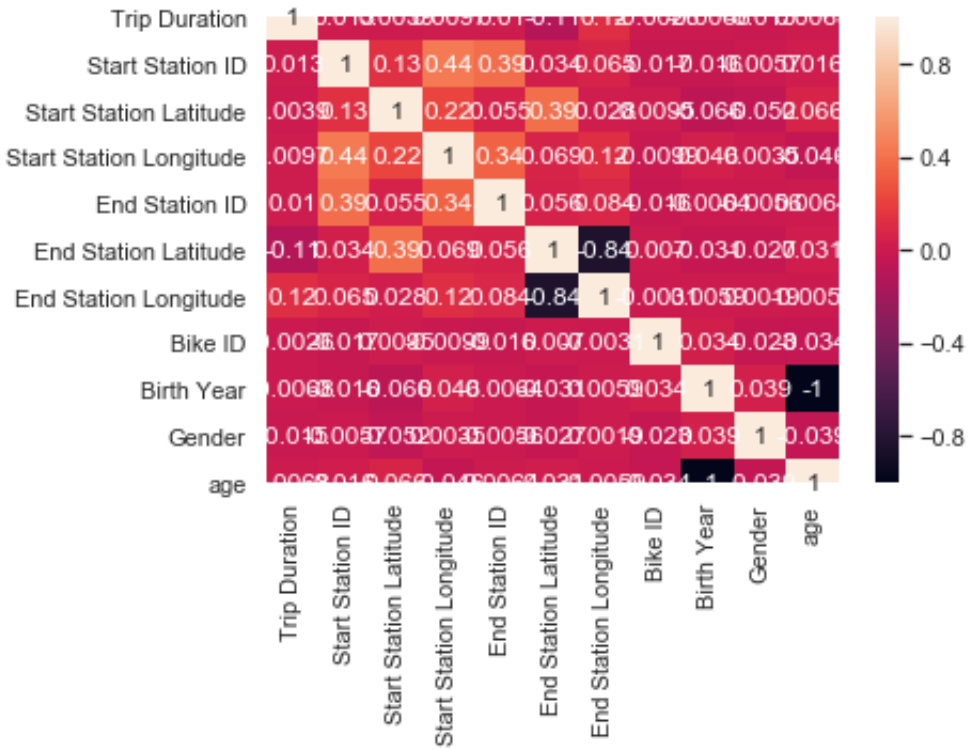
In [381]:
```
weatherDf
```

Out[381]:

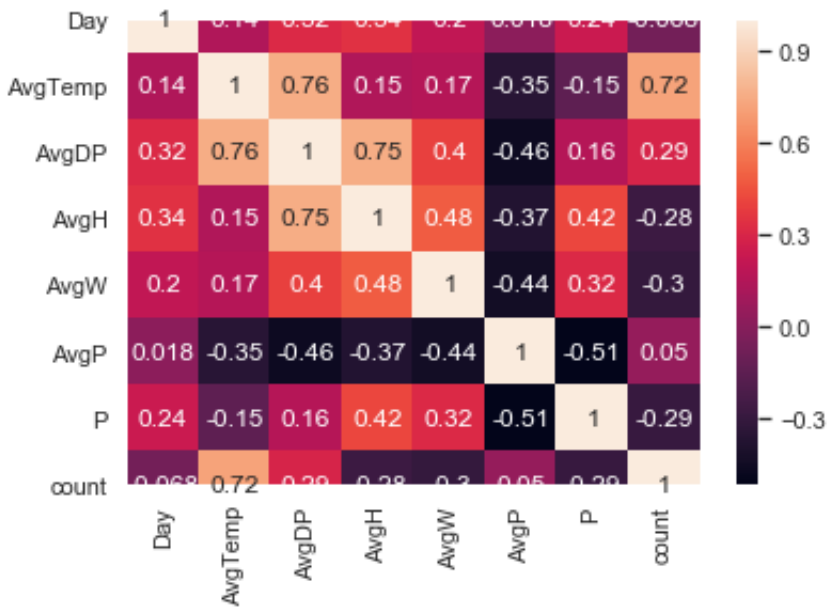
	Day	AvgTemp	AvgDP	AvgH	AvgW	AvgP	P	count
0	1	59.2	53.1	81.3	8.0	29.7	0.00	40401
1	2	48.0	23.3	38.7	10.7	29.8	0.12	35517
2	3	34.9	12.8	41.1	6.4	30.3	0.00	30927
3	4	26.7	6.2	42.8	5.5	30.5	0.00	15498
4	5	28.6	1.2	33.3	4.3	30.6	0.00	15760
5	6	36.9	17.7	47.0	5.3	30.5	0.00	32344
6	7	47.5	41.7	80.5	4.3	30.2	0.00	29574
7	8	54.7	34.0	49.6	11.5	29.9	0.16	43172
8	9	55.2	22.6	29.2	10.2	29.9	0.00	44866
9	10	37.4	25.8	66.1	7.6	29.9	0.00	18351
10	11	26.2	9.7	50.0	5.8	30.2	0.24	15060
11	12	27.7	9.4	46.7	4.9	30.3	0.00	13357
12	13	30.1	11.8	48.3	6.2	30.4	0.00	27303
13	14	30.8	27.5	88.1	14.1	29.6	0.32	0
14	15	25.9	15.7	65.3	8.3	29.6	0.71	0
15	16	33.3	15.0	49.3	8.7	30.0	0.00	0
16	17	38.1	19.1	47.5	8.1	30.2	0.00	7029
17	18	36.8	27.7	70.9	12.2	30.2	0.00	4073
18	19	41.9	24.3	52.2	9.8	30.2	0.07	10397
19	20	44.4	19.1	38.2	5.2	30.1	0.00	27269
20	21	50.4	29.0	44.5	5.6	29.9	0.00	36611
21	22	38.4	12.2	34.7	4.8	30.1	0.00	26806
22	23	35.0	9.2	37.9	6.4	30.5	0.00	29716
23	24	44.8	28.6	53.9	9.0	30.3	0.00	33824
24	25	50.7	38.3	63.4	7.8	30.2	0.00	28948
25	26	41.1	35.3	79.8	12.9	30.4	0.10	19603
26	27	44.7	41.8	89.7	7.0	30.1	0.02	26166

27	28	44.4	42.5	93.1	9.9	29.9	0.42	21493
28	29	50.3	34.9	60.1	4.7	30.1	0.43	42157
29	30	44.5	27.0	51.0	6.9	30.2	0.00	39375
30	31	40.4	37.8	91.0	14.9	30.0	0.33	6932

In [382]:
```
import matplotlib.pyplot as plt

sns.set(font_scale=1)
sns.heatmap(df.corr(), annot=True)
plt.show()
```



In [383]:
```
sns.set(font_scale=1)

sns.heatmap(weatherDf.corr(), annot=True)
plt.show()
```



In [384]:
```
# Now let's setup a test and train for the month of March 2017
from sklearn.model_selection import train_test_split
#X_train, X_test, y_train, y_test = train_test_split(weatherDf.drop(co
lumns = ['count'], axis=1), weatherDf['count'], test_size=0.3)

#X = np.array(weatherDf.drop(weatherDf[['Day', 'count']], 1))
y = np.array(weatherDf['count'])

X = np.array(weatherDf.drop(weatherDf[['Day']], 1))


X_train, X_test, y_train, y_test = train_test_split(X, y, test_size =
0.2)
```

In [385]:
```
def rmsle(y, y_):
    log1 = np.nan_to_num(np.array([np.log(v + 1) for v in y]))
    log2 = np.nan_to_num(np.array([np.log(v + 1) for v in y_]))
    calc = (log1 - log2) ** 2
    return np.sqrt(np.mean(calc))
```

In [386]:
```
from sklearn.linear_model import LinearRegression
clfL = LinearRegression(normalize= True)
clfL.fit(X_train, y_train)
print("Linear regression accuracy => ", clfL.score(X_test, y_test), "\
nRMSLE => ", rmsle(y_test, clfL.predict(X_test)))
```

```
Linear regression accuracy =>  1.0
RMSLE =>  1.9235771486495422e-11
```

In [387]:
```
from sklearn.tree import DecisionTreeRegressor

clfD = DecisionTreeRegressor()
clfD.fit(X_train, y_train)
print("Decision Tree accuracy => ", clfD.score(X_test, y_test), "\nRMS
LE => ", rmsle(y_test, clfD.predict(X_test)))
```

```
Decision Tree accuracy =>  0.9707143110730114
RMSLE =>  0.10055848269075164
```

In [388]:
```
from sklearn.ensemble import RandomForestRegressor

clf = RandomForestRegressor(n_estimators=200, max_depth=4, oob_score=T
rue)
clf.fit(X_train, y_train)
print('Random Forest accuracy => ', clf.score(X_test, y_test), "\nRMSL
E => ", rmsle(y_test, clf.predict(X_test)))
```

```
Random Forest accuracy =>  0.9747735672650731
RMSLE =>  2.9909384573991433
```

In [389]:
```
clf.feature_importances_
```

Out[389]:
```
array([0.01483455, 0.00824899, 0.00751122, 0.01801923, 0.01001448,
       0.00251856, 0.93885296])
```

In [390]:
```
weatherDf.columns
```

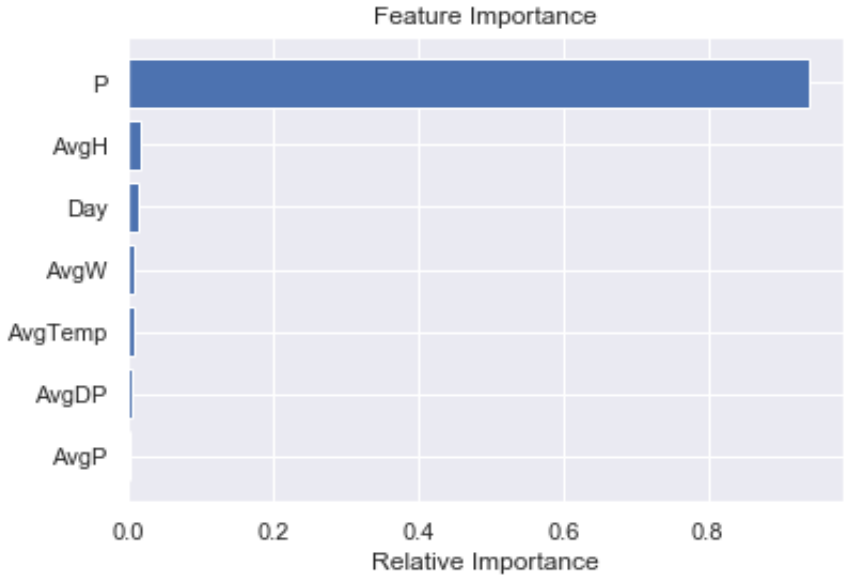
Out[390]:
```
Index(['Day', 'AvgTemp', 'AvgDP', 'AvgH', 'AvgW', 'AvgP', 'P', 'coun
t'], dtype='object')
```

In [391]:
```
dfTest = weatherDf
dfTest.drop(['count'], axis=1, inplace=True)
dfTest.columns
```

Out[391]:
```
Index(['Day', 'AvgTemp', 'AvgDP', 'AvgH', 'AvgW', 'AvgP', 'P'], dtyp
e='object')
```

In [392]:
```
importances = clf.feature_importances_
indices = np.argsort(importances)
features = dfTest.columns
```

In [393]:
```
plt.title('Feature Importance')
#plt.barh(dfTest.columns, clf.feature_importances_.argsort())
plt.barh(range(len(indices)), importances[indices])

plt.yticks(range(len(indices)), [features[i] for i in indices])
plt.xlabel('Relative Importance')
plt.show()
```



In [394]:
```
pred_test = clf.predict(X_test)
pred_train = clf.predict(X_train)
```

In [395]:
```
from sklearn.metrics import r2_score
from scipy.stats import spearmanr, pearsonr
test_score = r2_score(y_test, pred_test)
spearman = spearmanr(y_test, pred_test)
pearson = pearsonr(y_test, pred_test)
```

In [396]:
```
print(f'Out of bag R-2 score estimate: {clf.oob_score_:>5.3}')
print(f'Test data R-2 score:  {test_score:>5.3}')
print(f'Test data Spearman correlation: {spearman[0]:.3}')
print(f'Test data Pearson correlation: {pearson[0]:.3}')
```

```
Out of bag R-2 score estimate:  0.96
Test data R-2 score:  0.975
Test data Spearman correlation: 1.0
Test data Pearson correlation: 0.995
```

In [397]:
```
clf
```

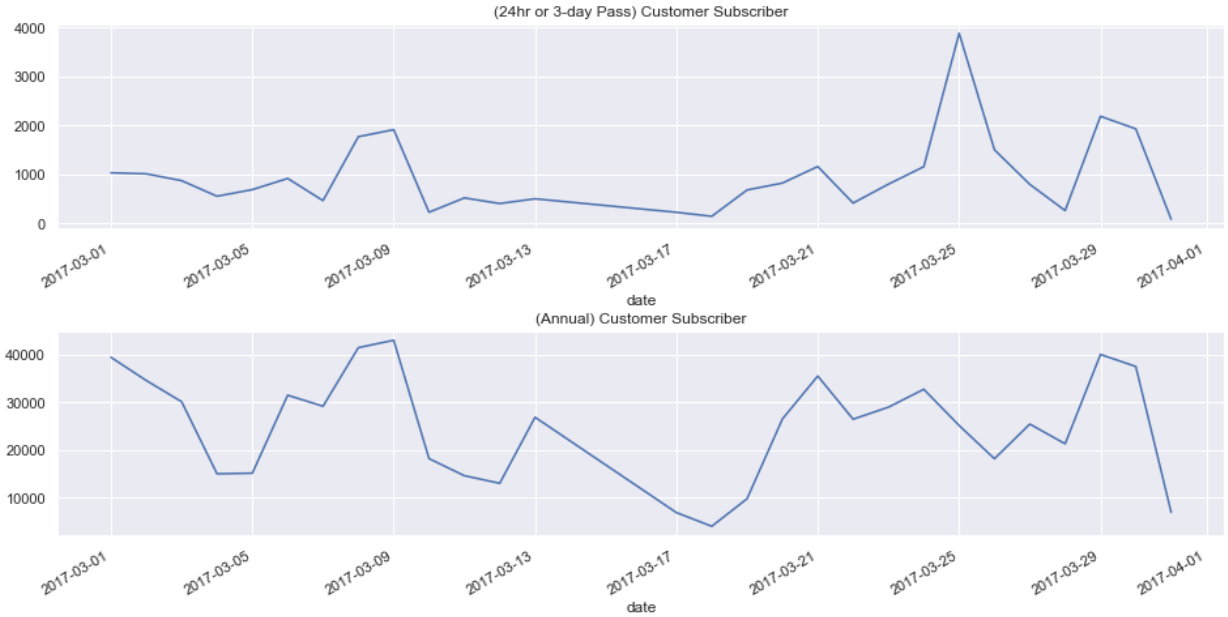
Out[397]:
```
RandomForestRegressor(bootstrap=True, criterion='mse', max_depth=4,
                      max_features='auto', max_leaf_nodes=None,
                      min_impurity_decrease=0.0, min_impurity_split=
None,
                      min_samples_leaf=1, min_samples_split=2,
                      min_weight_fraction_leaf=0.0, n_estimators=200
,
                      n_jobs=None, oob_score=True, random_state=None
, verbose=0,
                      warm_start=False)
```

In [398]:
```
#df[['count', 'workingday']].groupby(['workingday'], as_index = False)
.mean().sort_values(by = 'count')
#df[['Start Station Name','Start Time']].groupby(['Start Station Name'
]), as_index = False).sum().sort_values(by = 'Start Station Name')
```

In [399]:
```
ind = pd.DatetimeIndex(df['Start Time'])
df['date'] = ind.date.astype('datetime64')
df['hour'] = ind.hour
```

In [400]:
```
#df['Start Time'].count()
by_date = df.pivot_table('Start Station ID', aggfunc='count',
                         index='date',
                         columns='User Type',)
```

In [401]:
```
fig, ax = plt.subplots(2, figsize=(16,8))
fig.subplots_adjust(hspace=0.5)
by_date.iloc[:,0].plot(ax=ax[0], title='(24hr or 3-day Pass) Customer Subscriber');
by_date.iloc[:,1].plot(ax=ax[1], title='(Annual) Customer Subscriber')
;
```



In [402]:
```
by_date.head()
#df.head()
```

Out[402]:

User Type	Customer	Subscriber
date		
2017-03-01	1027	39374
2017-03-02	1006	34511
2017-03-03	867	30060
2017-03-04	549	14949
2017-03-05	684	15076

In [403]:
```
count_by_date = df.pivot_table('Start Station ID', aggfunc='count',
                               index='date',)
```

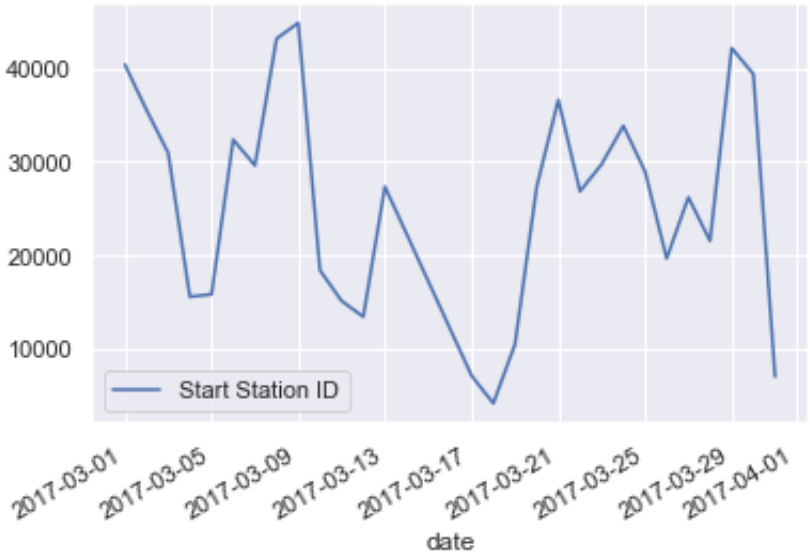
In [404]:
```
#count_by_date.head()
#count_by_date.describe
count_by_date.style
```

Out[404]:

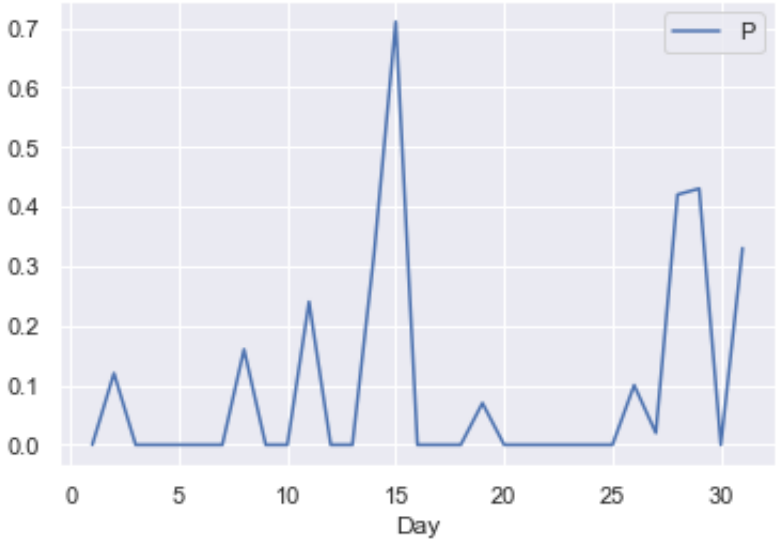
date	Start Station ID
2017-03-01 00:00:00	40401
2017-03-02 00:00:00	35517
2017-03-03 00:00:00	30927
2017-03-04 00:00:00	15498
2017-03-05 00:00:00	15760
2017-03-06 00:00:00	32344
2017-03-07 00:00:00	29574
2017-03-08 00:00:00	43172
2017-03-09 00:00:00	44866
2017-03-10 00:00:00	18351
2017-03-11 00:00:00	15060
2017-03-12 00:00:00	13357
2017-03-13 00:00:00	27303
2017-03-17 00:00:00	7029
2017-03-18 00:00:00	4073
2017-03-19 00:00:00	10397
2017-03-20 00:00:00	27269
2017-03-21 00:00:00	36611
2017-03-22 00:00:00	26806
2017-03-23 00:00:00	29716
2017-03-24 00:00:00	33824
2017-03-25 00:00:00	28948
2017-03-26 00:00:00	19603
2017-03-27 00:00:00	26166
2017-03-28 00:00:00	21493
2017-03-29 00:00:00	42157
2017-03-30 00:00:00	39375
2017-03-31 00:00:00	6932

In [405]:
```
count_by_date.plot()
```

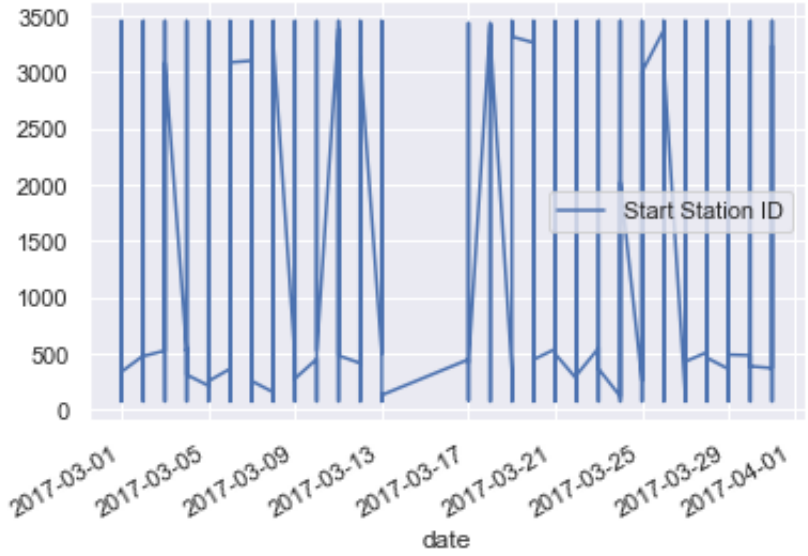
Out[405]: <matplotlib.axes._subplots.AxesSubplot at 0x7fcae0626310>



In [406]:
```
# now print weatherdf
import matplotlib.pyplot as plt
ax = plt.gca()

weatherDf.plot(kind='line',x='Day',y='P',ax=ax)
plt.show()
```



In [407]:
```
ax = plt.gca()

df.plot(kind='line',x='date',y='Start Station ID',ax=ax)
#df.plot(kind='line',x='Day',y='AvgDP', color='red', ax=ax)

plt.show()
```



In [408]:
```
group_by_start_station = (df.groupby(['Start Station ID'])
                     .apply(lambda x: (x['Start Station ID']==519).coun
t())
                     .reset_index(name='count'))
```

In [409]:
```
#group_by_start_station['Start Station ID']==519
print(group_by_start_station)
```

```
     Start Station ID  count
0                  72   1887
1                  79   1256
2                  82    547
3                  83    567
4                 116   2216
..                ...    ...
609              3452    263
610              3453    324
611              3454    257
612              3455    157
613              3456     26

[614 rows x 2 columns]
```

In [410]:
```
print(group_by_start_station['Start Station ID'].values[519])
```

```
3348
```

In [411]:
```
print(group_by_start_station.nlargest(5, 'count'))
```

```
     Start Station ID  count
269               519   9040
250               497   5429
194               435   5276
245               492   5265
168               402   5152
```

In [412]:
```
#count_by_date2 = df.pivot_table(index=['Start Station Name','Start St
ation ID'],aggfunc=np.sum,values=['mycount'])

#countdate2 = df.pivot_table(df.loc[df['Start Station ID']=='519'], in
dex='date', aggfunc='count')

countsdate2 = df['Start Station ID'].value_counts(normalize=True)

#count_by_date = df.pivot_table('Start Station ID', aggfunc='count',
#                               index='date',)
```

In [413]:
```
countdate2 = df
countdate2.head()
#countdate2 == 519
#countsdate2 = df.groupby('Start Station ID').filter(lambda x: x.value
s[519]==519)


#count_by_date2 = countdate2.eq('Start Station ID' == 519).pivot_table
('Start Station ID', aggfunc='count',
#                               index='date',)

df6 = countdate2.loc['2017-03-08']
```

In [414]:
```
#df6['Start Station ID']==519
df6.shape
```

Out[414]:
```
(43172, 19)
```

In [415]:
```
onecountNoRain=0
for index, row in df6.iterrows():
    if row['Start Station ID'] == 519:  # Pershing Square North
        #print(row['Start Time'], row['Start Station Name'])
        onecountNoRain = onecountNoRain + 1
```

In [416]:
```
onecountNoRain
```

Out[416]: 542

In [417]:
```
df6 = countdate2.loc['2017-03-17']

onecountRain=0
for index, row in df6.iterrows():
    if row['Start Station ID'] == 519:  # Pershing Square North
        #print(row['Start Time'], row['Start Station Name'])
        onecountRain = onecountRain + 1
```

In [418]:
```
onecountRain
```

Out[418]: 129

In [ ]: