```
cd C:\Users\dhant\OneDrive\Desktop\simplilearn\DS with python\project3
```

```
C:\Users\dhant\OneDrive\Desktop\simplilearn\DS with python\project3
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import pylab as p
import missingno as msno
import warnings
import calendar
warnings.filterwarnings('ignore')
```

```
data=pd.read_csv('Comcast_telecom_complaints_data.csv')
data.head(3)
```

```
  Ticket #                            Customer Complaint      Date  \
0   250635                 Comcast Cable Internet Speeds  22-04-15   
1   223441  Payment disappear - service got disconnected  04-08-15   
2   242732                             Speed and Service  18-04-15   

  Date_month_year         Time        Received Via      City     State  
\
0       22-Apr-15   3:53:50 PM  Customer Care Call  Abingdon  Maryland   

1       04-Aug-15  10:22:56 AM            Internet   Acworth   Georgia   

2       18-Apr-15   9:55:47 AM            Internet   Acworth   Georgia   


   Zip code  Status Filing on Behalf of Someone  
0     21009  Closed                          No  
1     30102  Closed                          No  
2     30101  Closed                         Yes  
```

```
data.shape
```

```
(2224, 11)
```

```
data.size
```

```
24464
```

```
data.columns
```

```
Index(['Ticket #', 'Customer Complaint', 'Date', 'Date_month_year',
'Time',
       'Received Via', 'City', 'State', 'Zip code', 'Status',
       'Filing on Behalf of Someone'],
      dtype='object')
```

```
data.dtypes
```

```
Ticket #                       object
Customer Complaint             object
Date                           object
Date_month_year                object
Time                           object
Received Via                   object
City                           object
State                          object
Zip code                        int64
Status                         object
Filing on Behalf of Someone    object
dtype: object
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2224 entries, 0 to 2223
Data columns (total 11 columns):
 #   Column                       Non-Null Count  Dtype 
---  ------                       --------------  ----- 
 0   Ticket #                     2224 non-null   object
 1   Customer Complaint           2224 non-null   object
 2   Date                         2224 non-null   object
 3   Date_month_year              2224 non-null   object
 4   Time                         2224 non-null   object
 5   Received Via                 2224 non-null   object
 6   City                         2224 non-null   object
 7   State                        2224 non-null   object
 8   Zip code                     2224 non-null   int64 
 9   Status                       2224 non-null   object
 10  Filing on Behalf of Someone  2224 non-null   object
dtypes: int64(1), object(10)
memory usage: 191.2+ KB
```

```
data.nunique()
```

```
Ticket #                       2224
Customer Complaint             1841
Date                             91
Date_month_year                  91
Time                           2190
Received Via                      2
City                            928
State                            43
Zip code                       1543
Status                            4
Filing on Behalf of Someone       2
dtype: int64
```

Showing Basics Statistics

```
data.describe().style.background_gradient(axis=1,cmap=sns.light_palette('green', as_cmap=True))
```

```
<pandas.io.formats.style.Styler at 0x19bf6ba0f70>
```

```
data.describe(include=object)
```

```
       Ticket # Customer Complaint      Date Date_month_year  
Time  \
count      2224               2224      2224            2224   
2224   
unique     2224               1841        91              91   
2190   
top      362223            Comcast  24-06-15       24-Jun-15  2:45:12 
PM   
freq          1                 83       218             218   
2   

              Received Via      City    State  Status  \
count                 2224      2224     2224    2224   
unique                   2       928       43       4   
top     Customer Care Call   Atlanta  Georgia  Solved   
freq                  1119        63      288     973   

       Filing on Behalf of Someone  
count                         2224  
unique                           2  
top                             No  
freq                          2021  
```

```
print('The dataset has {0} samples.'.format(len(data)))
```

```
The dataset has 2224 samples.
```

```
import pandas_profiling as pp
from pandas_profiling import ProfileReport
pp.ProfileReport(data)
```

{"version_major":2,"version_minor":0,"model_id":"1bc2cbc875ab4c6d9084321be3957e43"}

{"version_major":2,"version_minor":0,"model_id":"691a864ff73e44448b1bafea13dc995f"}

{"version_major":2,"version_minor":0,"model_id":"2ede11f52bcf44ccbf5f7ef8bf824709"}

```
<IPython.core.display.HTML object>
```

```
data.drop(columns=['Ticket #','Date','Zip code'],axis=1,inplace=True)
data.head(3)
```

```
                             Customer Complaint Date_month_year
Time  \
0                 Comcast Cable Internet Speeds       22-Apr-15
3:53:50 PM
1  Payment disappear - service got disconnected       04-Aug-15
10:22:56 AM
2                             Speed and Service       18-Apr-15
9:55:47 AM

         Received Via      City     State  Status Filing on Behalf of
Someone
0  Customer Care Call  Abingdon  Maryland  Closed
No
1            Internet   Acworth   Georgia  Closed
No
2            Internet   Acworth   Georgia  Closed
Yes
```

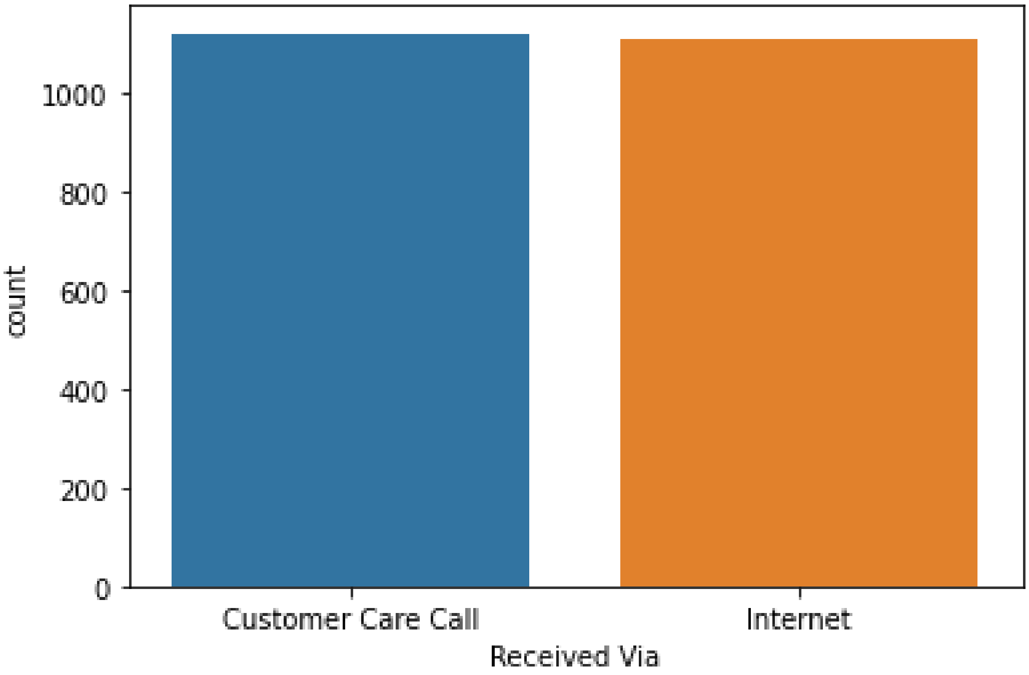
EDA

```
data['Customer Complaint'].value_counts()
```

```
Comcast                                       83
Comcast Internet                              18
Comcast Data Cap                              17
comcast                                       13
Comcast Billing                               11
                                              ..
Non working service                            1
misleading sales practice and advertising      1
Comcast/earthlink                              1
Comcast slow speeds and lying about prices     1
Complaints about comcast                       1
Name: Customer Complaint, Length: 1841, dtype: int64
```

```
data['Received Via'].value_counts()
sns.countplot('Received Via',data=data)
```

```
<AxesSubplot:xlabel='Received Via', ylabel='count'>
```



```
data['City'].value_counts()
```

```
Atlanta             63
Chicago             47
Knoxville           36
Houston             33
Jacksonville        31
                    ..
Lutherville          1
Lake Oswego          1
North Huntingdon     1
Toney                1
Colonia              1
Name: City, Length: 928, dtype: int64
```

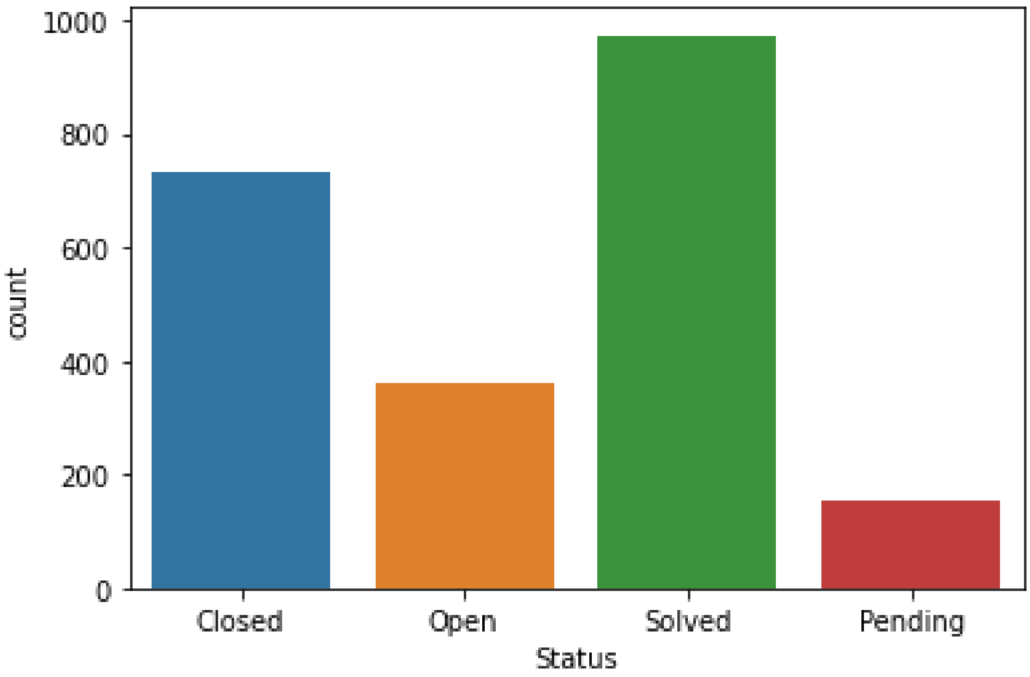
```
data['State'].value_counts()
```

```
Georgia                 288
Florida                 240
California              220
Illinois                164
Tennessee               143
Pennsylvania            130
Michigan                115
Washington               98
Colorado                 80
Maryland                 78
New Jersey               75
Texas                    71
Massachusetts            61
```

```
Virginia                 60
Indiana                  59
Oregon                   49
Mississippi              39
Minnesota                33
Alabama                  26
Utah                     22
Arizona                  20
South Carolina           18
District Of Columbia     16
New Mexico               15
Louisiana                13
Delaware                 12
New Hampshire            12
Connecticut              12
West Virginia            11
Kentucky                  7
New York                  6
Arkansas                  6
Maine                     5
Missouri                  4
Vermont                   3
Ohio                      3
North Carolina            3
Kansas                    2
Montana                   1
Rhode Island              1
Nevada                    1
Iowa                      1
District of Columbia      1
Name: State, dtype: int64
```

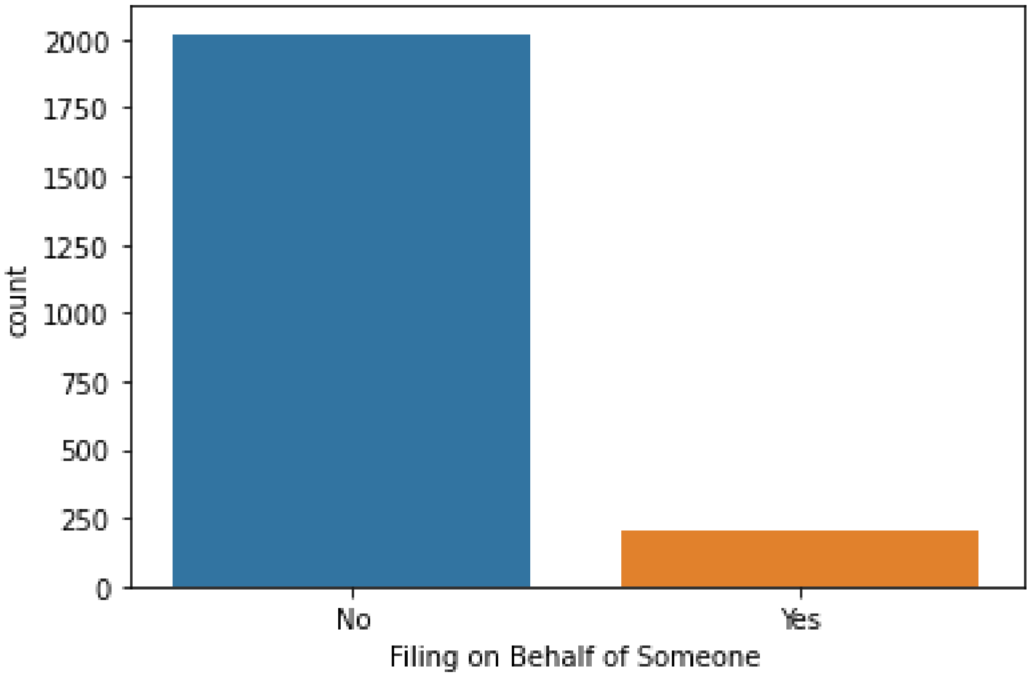
```
data['Status'].value_counts()
sns.countplot('Status',data=data)
```

```
<AxesSubplot:xlabel='Status', ylabel='count'>
```



```
data['Filing on Behalf of Someone'].value_counts()
sns.countplot('Filing on Behalf of Someone',data=data)
```

```
<AxesSubplot:xlabel='Filing on Behalf of Someone', ylabel='count'>
```



Provide the trend chart for the number of complaints at monthly and daily granularity levels.

```
data.head(3)

                             Customer Complaint Date_month_year
Time  \
0                 Comcast Cable Internet Speeds       22-Apr-15
3:53:50 PM
1  Payment disappear - service got disconnected       04-Aug-15
10:22:56 AM
2                             Speed and Service       18-Apr-15
9:55:47 AM

         Received Via      City     State  Status Filing on Behalf of
Someone
0  Customer Care Call  Abingdon  Maryland  Closed
No
1            Internet   Acworth   Georgia  Closed
No
2            Internet   Acworth   Georgia  Closed
Yes

data['Date_month_year'] = pd.to_datetime(data['Date_month_year'])
data.head(3)

                             Customer Complaint Date_month_year
Time  \
0                 Comcast Cable Internet Speeds      2015-04-22
3:53:50 PM
1  Payment disappear - service got disconnected      2015-08-04
10:22:56 AM
2                             Speed and Service      2015-04-18
9:55:47 AM

         Received Via      City     State  Status Filing on Behalf of
Someone
0  Customer Care Call  Abingdon  Maryland  Closed
No
1            Internet   Acworth   Georgia  Closed
No
2            Internet   Acworth   Georgia  Closed
Yes

Date_month_year= pd.to_datetime(data['Date_month_year'].dt.date)
#data['Date'] = pd.to_datetime(Date_month_year.dt.date)
data['Month'] = Date_month_year.dt.month
data['Date'] = Date_month_year.dt.day
data['Day_No'] = data['Date_month_year'].dt.weekday
data['Month'] = (data.Date_month_year.dt.month).apply(lambda x:
calendar.month_abbr[x])
```

```
data['Day_Name'] =
data['Day_No'].map({0:'Monday',1:'Tuesday',2:'Wednesday',3:'Thursday',
4:'Friday',

5:'Saturday',6:'Sunday'})
data.head(3)
```

```
                             Customer Complaint Date_month_year
Time  \
0                 Comcast Cable Internet Speeds      2015-04-22
3:53:50 PM
1  Payment disappear - service got disconnected      2015-08-04
10:22:56 AM
2                             Speed and Service      2015-04-18
9:55:47 AM

         Received Via      City     State  Status Filing on Behalf of
Someone  \
0  Customer Care Call  Abingdon  Maryland  Closed
No
1            Internet   Acworth   Georgia  Closed
No
2            Internet   Acworth   Georgia  Closed
Yes

  Month  Date  Day_No   Day_Name
0   Apr    22       2  Wednesday
1   Aug     4       1    Tuesday
2   Apr    18       5   Saturday
```

```
monthly_compliant=pd.DataFrame(data.groupby(['Month'])['Customer
Complaint'].value_counts())
monthly_compliant.head(30)
```

```
                                                          Customer
Complaint
Month Customer Complaint

Apr   Comcast
16
      comcast
4
      Comcast data caps
3
      availabilty
3
      Billing
2
      Billing Issues
2
```

Comcast -Exfinity customer service errors, lies...	2
Comcast Billing	2
Comcast Complaint	2
Comcast Internet	2
Comcast Internet Service	2
Comcast internet for low income families	2
Comcast/Xfinity	2
Continued slowness for almost 3 weeks	2
Data cap	2
billing issues	2
comcast unwilling to resolve data usage issue	2
300 GB monthly allowance	1
300GB/month data cap 'trial' for several years now	1
Abysmal customer service, do not approve merger...	1
Apartment Management's Exclusivity Contract wit...	1
Awful Service!	1
Bait and Switch again	1
Bait and switch, unfulfilled incentives	1
Being charged for a technician fee	1
Billed for service never received	1
Billed for services not ordered or recieved	1
Billing - Comcast	1
Billing Error	1
Billing Issues/Service Issues	1

```
monthly_data = data['Month'].value_counts().to_frame()
months_order = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul',
'Aug', 'Sep', 'Oct', 'Nov', 'Dec']
monthly_data = monthly_data.reindex(months_order,
axis=0).reset_index().rename(columns={'index':'Month','Month':'Complai
nt'})
#monthly_data['Complaint']=monthly_data['Complaint'].fillna(0)
monthly_data
```

```
   Month  Complaint
0    Jan         55
1    Feb         59
2    Mar         45
3    Apr        375
4    May        317
5    Jun       1046
6    Jul         49
7    Aug         67
8    Sep         55
9    Oct         53
10   Nov         38
11   Dec         65
```

```
Jan_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Jan_month[Jan_month.Month=='Jan'])
feb_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(feb_month[feb_month.Month=='Feb'])
Mar_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Mar_month[Mar_month.Month=='Mar'])
Apr_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Apr_month[Apr_month.Month=='Apr'])
May_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(May_month[May_month.Month=='May'])
Jun_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Jun_month[Jun_month.Month=='Jun'])
Jul_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Jul_month[Jul_month.Month=='Jul'])
```

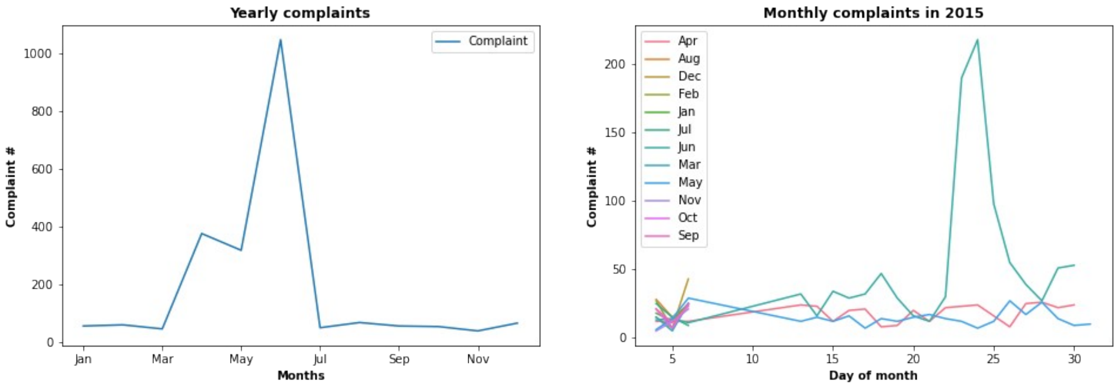
```
Aug_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Aug_month[Aug_month.Month=='Aug'])
Sep_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Sep_month[Sep_month.Month=='Sep'])
Oct_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Oct_month[Oct_month.Month=='Oct'])
Nov_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
print(Nov_month[Nov_month.Month=='Nov'])
Dec_month = data.groupby(['Month','Date']).count()
['City'].to_frame().reset_index().rename(columns={
    'City':'Complaints'})
Dec_month[Dec_month.Month=='Dec']
```

```
   Month  Date  Complaints
30   Jan     4          18
31   Jan     5          12
32   Jan     6          25
   Month  Date  Complaints
27   Feb     4          27
28   Feb     5           7
29   Feb     6          25
   Month  Date  Complaints
57   Mar     4          15
58   Mar     5           5
59   Mar     6          25
   Month  Date  Complaints
0    Apr     4          12
1    Apr     5          12
2    Apr     6          12
3    Apr    13          24
4    Apr    14          23
5    Apr    15          12
6    Apr    16          20
7    Apr    17          21
8    Apr    18           8
9    Apr    19           9
10   Apr    20          20
11   Apr    21          12
12   Apr    22          22
13   Apr    23          23
14   Apr    24          24
15   Apr    25          16
```

```
16   Apr    26           8
17   Apr    27          25
18   Apr    28          26
19   Apr    29          22
20   Apr    30          24
   Month  Date  Complaints
60   May     4           6
61   May     5          14
62   May     6          29
63   May    13          12
64   May    14          15
65   May    15          12
66   May    16          16
67   May    17           7
68   May    18          14
69   May    19          12
70   May    20          15
71   May    21          17
72   May    22          14
73   May    23          12
74   May    24           7
75   May    25          12
76   May    26          27
77   May    27          17
78   May    28          26
79   May    29          14
80   May    30           9
81   May    31          10
   Month  Date  Complaints
36   Jun     4          13
37   Jun     5          14
38   Jun     6          11
39   Jun    13          32
40   Jun    14          16
41   Jun    15          34
42   Jun    16          29
43   Jun    17          32
44   Jun    18          47
45   Jun    19          29
46   Jun    20          16
47   Jun    21          12
48   Jun    22          30
49   Jun    23         190
50   Jun    24         218
51   Jun    25          98
52   Jun    26          55
53   Jun    27          39
54   Jun    28          27
55   Jun    29          51
56   Jun    30          53
```

```
   Month  Date  Complaints
33   Jul     4          25
34   Jul     5          15
35   Jul     6           9
   Month  Date  Complaints
21   Aug     4          28
22   Aug     5          15
23   Aug     6          24
   Month  Date  Complaints
88   Sep     4          21
89   Sep     5          11
90   Sep     6          23
   Month  Date  Complaints
85   Oct     4          21
86   Oct     5           7
87   Oct     6          25
   Month  Date  Complaints
82   Nov     4           5
83   Nov     5          12
84   Nov     6          21

   Month  Date  Complaints
24   Dec     4          15
25   Dec     5           7
26   Dec     6          43
```

```
fig,ax = plt.subplots(1,2,figsize=(16,5))

monthly = monthly_data.plot.line(x='Month',y='Complaint',ax=ax[0])
monthly.set_xlabel('Months',weight='bold')
monthly.set_ylabel('Complaint #',weight='bold')
monthly.set_title('Yearly complaints',weight='bold')

daily =
sns.lineplot(x=Jun_month.Date,y=Jun_month['Complaints'],hue=Jun_month.
Month,ax=ax[1])
daily.set_xlabel('Day of month',weight='bold')
daily.set_ylabel('Complaint #',weight='bold')
daily.legend(loc='upper left')
daily.set_title('Monthly complaints in 2015',weight='bold')

plt.show()
```



Provide a table with the frequency of complaint types

```
total_complaints=data.groupby(["Customer
Complaint"]).size().sort_values(ascending=False).to_frame().reset_inde
x().rename({0: "Count"}, axis=1)
total_complaints
```

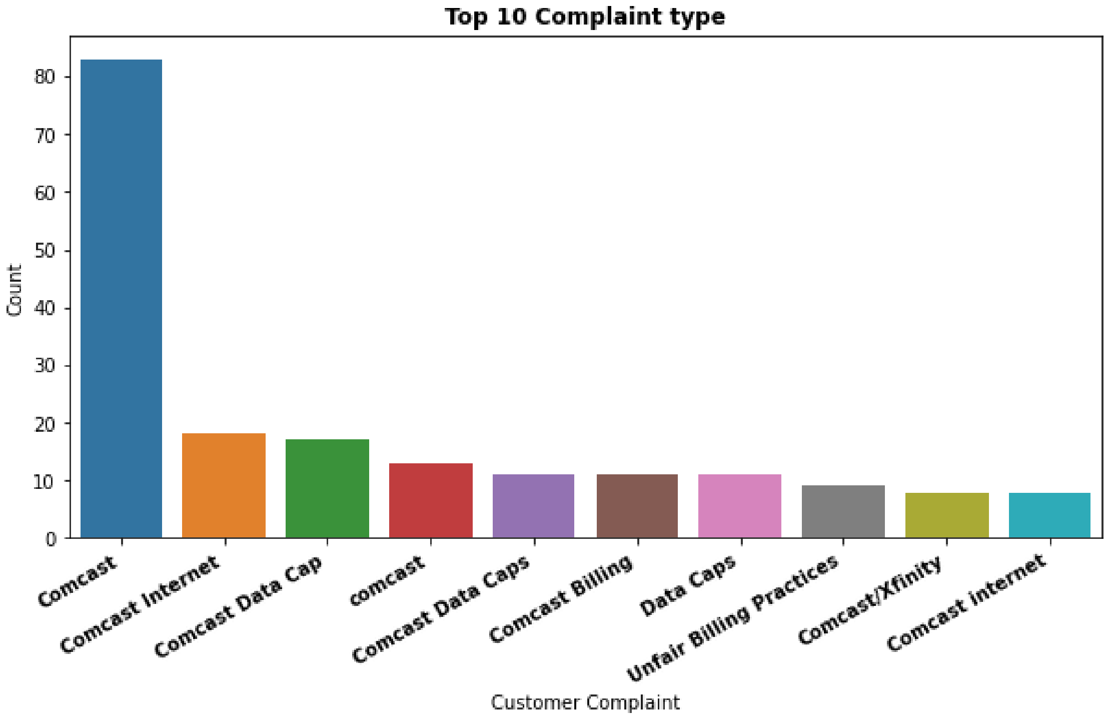
```
                                     Customer Complaint  Count
0                                               Comcast     83
1                                      Comcast Internet     18
2                                      Comcast Data Cap     17
3                                               comcast     13
4                                     Comcast Data Caps     11
...                                                 ...    ...
1836                               Lack of availability      1
1837     Lack of communication and poor customer service      1
1838                         Lack of consistent service      1
1839                             Lack of internet speed      1
1840   (Comcast is not my complaint!) Cyber Tele-mark...      1

[1841 rows x 2 columns]
```

Which complaint types are maximum i.e., around internet, network issues, or across any other domains.

```
#Top .5%

total_complaints[(total_complaints.Count*100)/total_complaints.Count.s
um() >= .5]
```

```
  Customer Complaint  Count
0            Comcast     83
1   Comcast Internet     18
2   Comcast Data Cap     17
3            comcast     13
```

```
plt.figure(figsize=(10,5))
comp = sns.barplot(x=total_complaints['Customer Complaint'].head(10),y=total_complaints.Count.head(10))
comp.set_title('Top 10 Complaint type',weight='bold')
comp.set_xticklabels(comp.get_xticklabels(), rotation=30, ha="right",size=10,weight='bold')
plt.show()
```

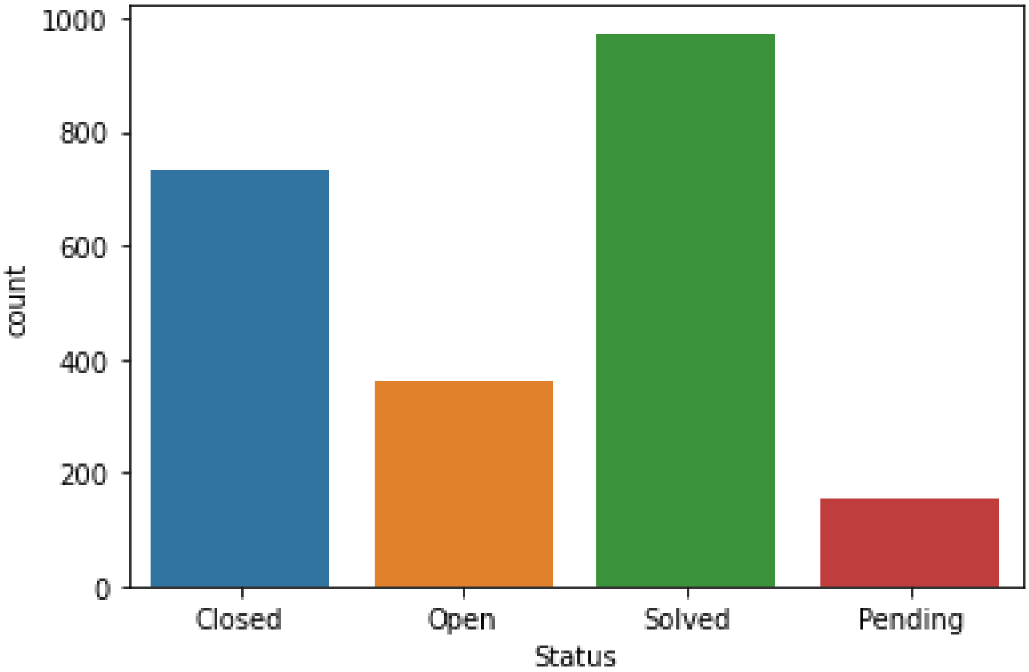


Create a new categorical variable with value as Open and Closed. Open & Pending is to be categorized as Open and Closed & Solved is to be categorized as Closed

```
print(data['Status'].value_counts())
sns.countplot('Status',data=data)
```

```
Solved     973
Closed     734
Open       363
Pending    154
Name: Status, dtype: int64
```

```
<AxesSubplot:xlabel='Status', ylabel='count'>
```



```
data['Status']=data['Status'].replace('Pending','Open',regex=True)
data['Status']=data['Status'].replace('Solved','Closed', regex=True)
data.head(5)
```

```
                                  Customer Complaint
Date_month_year  \
0                      Comcast Cable Internet Speeds      2015-04-22

1       Payment disappear - service got disconnected      2015-08-04

2                                  Speed and Service      2015-04-18

3  Comcast Imposed a New Usage Cap of 300GB that ...      2015-07-05

4          Comcast not working and no service to boot      2015-05-26


          Time        Received Via      City     State  Status  \
0   3:53:50 PM  Customer Care Call  Abingdon  Maryland  Closed
1  10:22:56 AM            Internet   Acworth   Georgia  Closed
2   9:55:47 AM            Internet   Acworth   Georgia  Closed
3  11:59:35 AM            Internet   Acworth   Georgia    Open
4   1:25:26 PM            Internet   Acworth   Georgia  Closed

  Filing on Behalf of Someone Month  Date  Day_No   Day_Name
0                          No   Apr    22       2  Wednesday
1                          No   Aug     4       1    Tuesday
2                         Yes   Apr    18       5   Saturday
```

```
3                         Yes    Jul     5       6     Sunday
4                          No    May    26       1    Tuesday
```

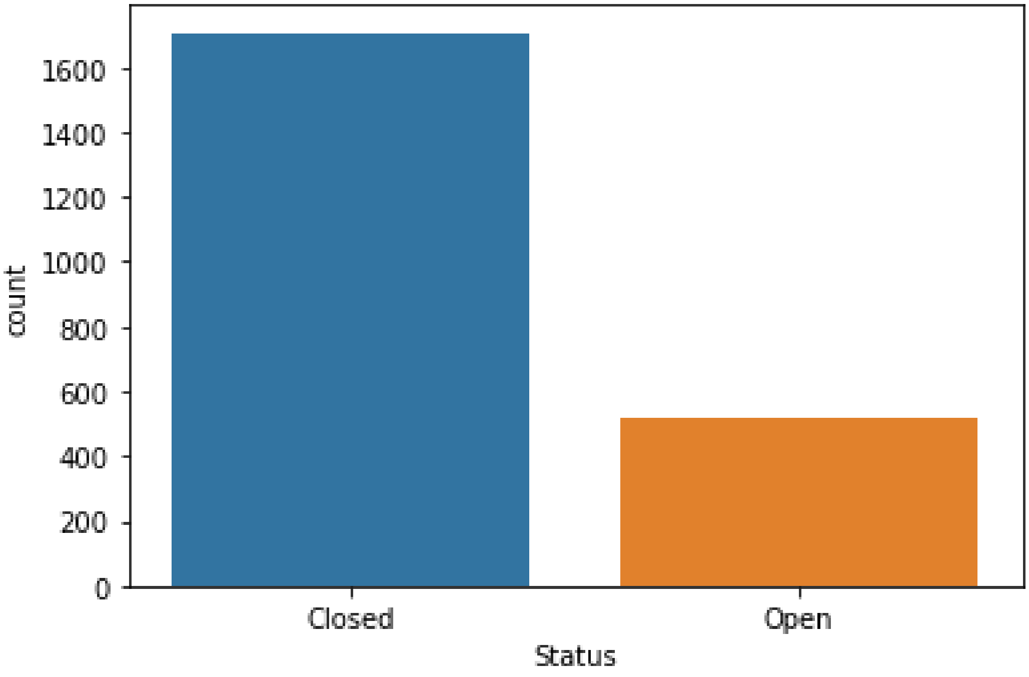
```
data['Status'].value_counts()
```

```
Closed    1707
Open       517
Name: Status, dtype: int64
```

```
print('after some changes the Status according to the above changes ')
print(data['Status'].value_counts())
sns.countplot('Status',data=data)
```

```
after some changes the Status according to the above changes
Closed    1707
Open       517
Name: Status, dtype: int64
```

```
<AxesSubplot:xlabel='Status', ylabel='count'>
```



- Provide state wise status of complaints in a stacked bar chart. Use the categorized variable from Q3. Provide insights on:

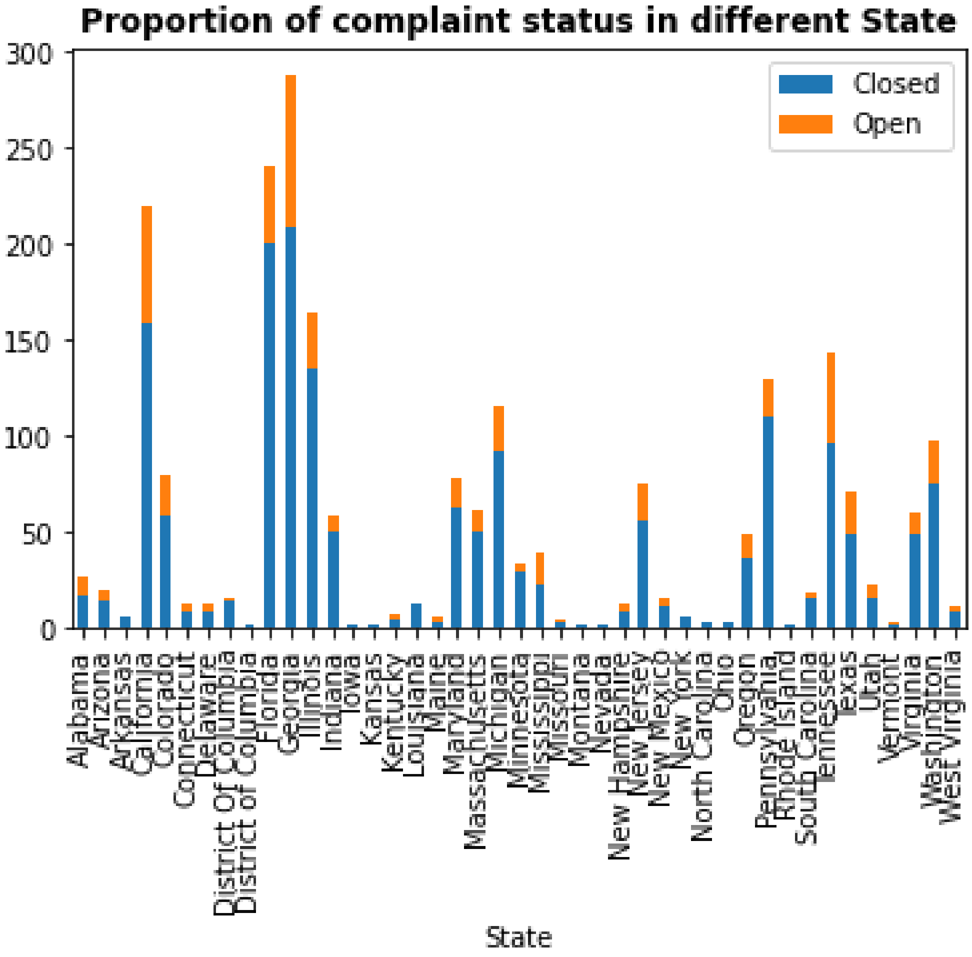
```
State_status = pd.crosstab(data.State,data.Status)
State_status.head()
```

```
Status      Closed  Open
State
Alabama         17     9
```

```
Arizona         14     6
Arkansas         6     0
California     159    61
Colorado        58    22
```

```
plt.figure(figsize=(10,30))

State_status.plot(kind='bar',stacked=True)
plt.title('Proportion of complaint status in different
State',weight='bold')
plt.legend(loc='best')

plt.show()
plt.tight_layout()
```

```
<Figure size 720x2160 with 0 Axes>
```

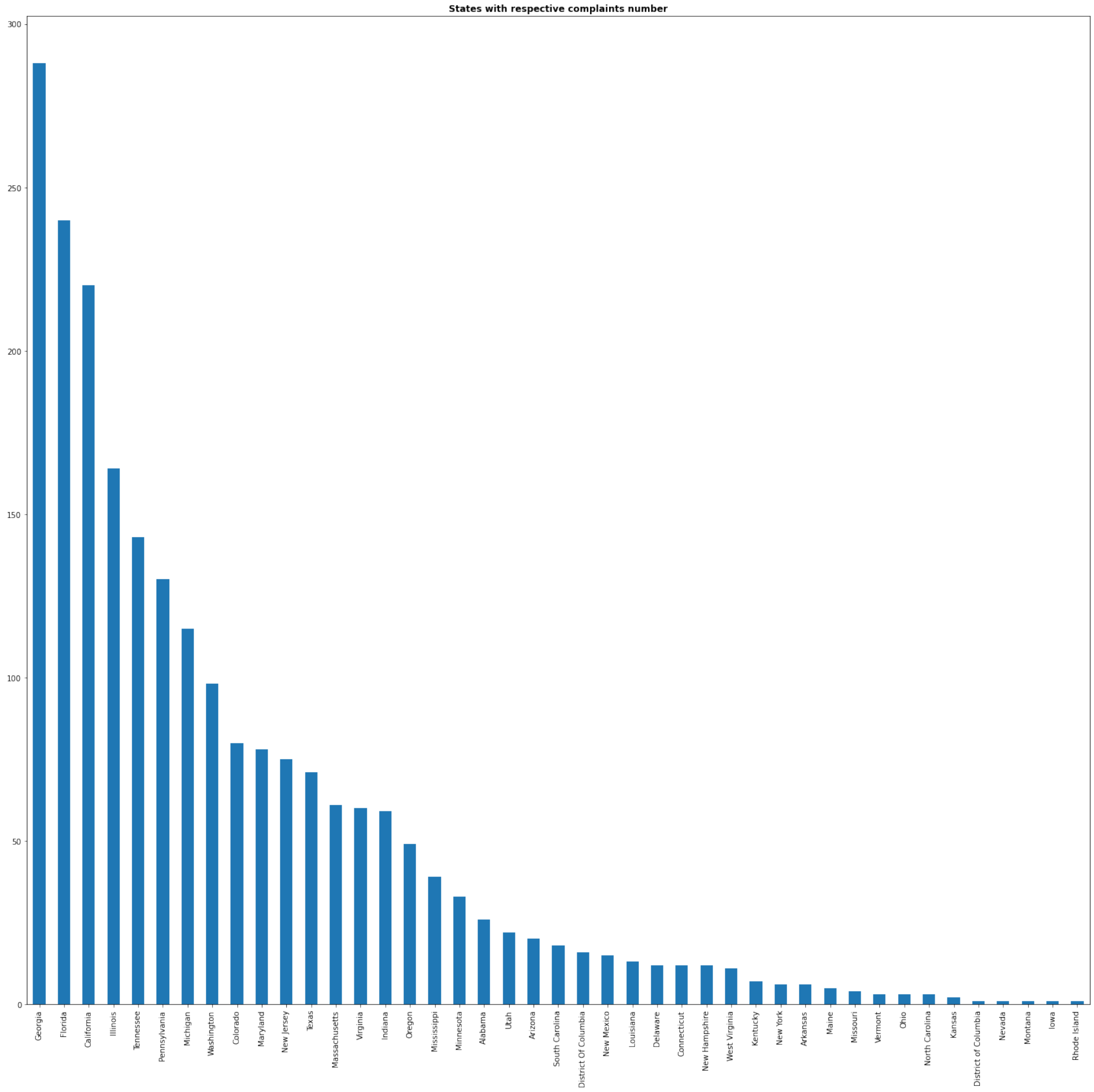


```
<Figure size 432x288 with 0 Axes>
```

Which state has the maximum complaints

```
print(data.State.value_counts().head(5))

data['State'].value_counts().plot(kind='bar', figsize=(20,20))
plt.title('States with respective complaints number',weight='bold')
plt.tight_layout()
```

```
Georgia       288
Florida       240
California    220
Illinois      164
Tennessee     143
Name: State, dtype: int64
```



Which state has the highest percentage of unresolved complaints

```
States_list=data.groupby(['State','Status']).count()
['City'].reset_index().rename(columns={'City':'Counts'})
States_list

            State  Status  Counts
0         Alabama  Closed      17
1         Alabama    Open       9
2         Arizona  Closed      14
3         Arizona    Open       6
4        Arkansas  Closed       6
..            ...     ...     ...
72       Virginia    Open      11
73     Washington  Closed      75
74     Washington    Open      23
75  West Virginia  Closed       8
76  West Virginia    Open       3

[77 rows x 3 columns]

States_list[(States_list.Counts==max(States_list[(States_list.Status==
'Open')].Counts))&(States_list.Status=='Open')]

      State Status  Counts
19  Georgia   Open      80
```

Provide the percentage of complaints resolved till date, which were received through the Internet and customer care calls.

```
SolveCom_InCus = data.groupby(['Received Via','Status']).count()
['City'].reset_index().rename(columns={'City':'Counts'})
SolveCom_InCus.head()

         Received Via  Status  Counts
0  Customer Care Call  Closed     864
1  Customer Care Call    Open     255
2            Internet  Closed     843
3            Internet    Open     262

sol_per = 
np.around((SolveCom_InCus.Counts[(SolveCom_InCus.Status=='Closed')&
                                           ((SolveCom_InCus['Received 
Via']=='Internet')
                                            |(SolveCom_InCus['Received 
Via']=='Customer Care Call'))
                                          ].sum()*100
/SolveCom_InCus.Counts.sum()),decimals=2)
print('Solved percentage till date = {} %'.format(sol_per))

Solved percentage till date = 76.75 %
```