Customer Service Requests Analysis

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1 Name: Sunil Pradhan

1.1 Project: 1

1.2 Project Name: Customer Service Requests Analysis

```
[1]: import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
     %matplotlib inline
```

```
[2]: df=pd.read_csv("311_Service_Requests_from_2010_to_Present.csv")
     df
```

```
C:\Users\sssun\anaconda3\lib\site-
packages\IPython\core\interactiveshell.py:3418: DtypeWarning: Columns (48,49)
have mixed types.Specify dtype option on import or set low_memory=False.
  exec(code_obj, self.user_global_ns, self.user_ns)
```

```
[2]:         Unique Key          Created Date          Closed Date Agency  \
     0        32310363  12/31/2015 11:59:45 PM       01-01-16 0:55   NYPD
     1        32309934  12/31/2015 11:59:44 PM       01-01-16 1:26   NYPD
     2        32309159  12/31/2015 11:59:29 PM       01-01-16 4:51   NYPD
     3        32305098  12/31/2015 11:57:46 PM       01-01-16 7:43   NYPD
     4        32306529  12/31/2015 11:56:58 PM       01-01-16 3:24   NYPD
     ...           ...                     ...                 ...    ...
     300693   30281872  03/29/2015 12:33:41 AM                 NaN   NYPD
     300694   30281230  03/29/2015 12:33:28 AM  03/29/2015 02:33:59 AM   NYPD
     300695   30283424  03/29/2015 12:33:03 AM  03/29/2015 03:40:20 AM   NYPD
     300696   30280004  03/29/2015 12:33:02 AM  03/29/2015 04:38:35 AM   NYPD
     300697   30281825  03/29/2015 12:33:01 AM  03/29/2015 04:41:50 AM   NYPD

                              Agency Name          Complaint Type  \
     0        New York City Police Department  Noise - Street/Sidewalk
     1        New York City Police Department        Blocked Driveway
     2        New York City Police Department        Blocked Driveway
     3        New York City Police Department         Illegal Parking
     4        New York City Police Department         Illegal Parking
```

```
...                             ...                        ...
300693  New York City Police Department      Noise - Commercial
300694  New York City Police Department        Blocked Driveway
300695  New York City Police Department      Noise - Commercial
300696  New York City Police Department      Noise - Commercial
300697  New York City Police Department      Noise - Commercial

                          Descriptor        Location Type  Incident Zip  \
0                 Loud Music/Party      Street/Sidewalk       10034.0
1                        No Access      Street/Sidewalk       11105.0
2                        No Access      Street/Sidewalk       10458.0
3       Commercial Overnight Parking     Street/Sidewalk       10461.0
4                 Blocked Sidewalk      Street/Sidewalk       11373.0
...                             ...                  ...           ...
300693          Loud Music/Party  Club/Bar/Restaurant           NaN
300694            Partial Access      Street/Sidewalk       11418.0
300695          Loud Music/Party  Club/Bar/Restaurant       11206.0
300696          Loud Music/Party  Club/Bar/Restaurant       10461.0
300697          Loud Music/Party     Store/Commercial       10036.0

                 Incident Address  … Bridge Highway Name  \
0            71 VERMILYEA AVENUE   …                 NaN
1              27-07 23 AVENUE    …                 NaN
2           2897 VALENTINE AVENUE  …                 NaN
3            2940 BAISLEY AVENUE   …                 NaN
4                 87-14 57 ROAD    …                 NaN
...                          ... …  …                  …
300693          CRESCENT AVENUE   …                 NaN
300694          100-17 87 AVENUE  …                 NaN
300695          162 THROOP AVENUE …                 NaN
300696  3151 EAST TREMONT AVENUE  …                 NaN
300697          251 WEST 48 STREET …                NaN

        Bridge Highway Direction Road Ramp Bridge Highway Segment  \
0                            NaN       NaN                     NaN
1                            NaN       NaN                     NaN
2                            NaN       NaN                     NaN
3                            NaN       NaN                     NaN
4                            NaN       NaN                     NaN
...                          ...       …                       …
300693                       NaN       NaN                     NaN
300694                       NaN       NaN                     NaN
300695                       NaN       NaN                     NaN
300696                       NaN       NaN                     NaN
300697                       NaN       NaN                     NaN

        Garage Lot Name Ferry Direction Ferry Terminal Name   Latitude  \
```

```
       0             NaN            NaN            NaN  40.865682
       1             NaN            NaN            NaN  40.775945
       2             NaN            NaN            NaN  40.870325
       3             NaN            NaN            NaN  40.835994
       4             NaN            NaN            NaN  40.733060
...            ...            ...            ...        ...
300693            NaN            NaN            NaN        NaN
300694            NaN            NaN            NaN  40.694077
300695            NaN            NaN            NaN  40.699590
300696            NaN            NaN            NaN  40.837708
300697            NaN            NaN            NaN  40.760583

         Longitude                                   Location
0       -73.923501   (40.86568153633767, -73.92350095571744)
1       -73.915094  (40.775945312321085, -73.91509393898605)
2       -73.888525  (40.870324522111424, -73.88852464418646)
3       -73.828379   (40.83599404683083, -73.82837939584206)
4       -73.874170  (40.733059618956815, -73.87416975810375)
...            ...                                        ...
300693        NaN                                        NaN
300694 -73.846087   (40.69407728322387, -73.8460866160573)
300695 -73.944234   (40.69959035300927, -73.94423377144169)
300696 -73.834587    (40.8377075854206, -73.83458731019586)
300697 -73.985922   (40.76058322950115, -73.98592204392392)

[300698 rows x 53 columns]
```

```python
#renaming Column names to lower case and replacing " " with "_"
df.columns=list(map(lambda x: x.replace(' ', '_').lower(),df.columns))
df
```

```
[3]:        unique_key          created_date             closed_date agency  \
       0      32310363  12/31/2015 11:59:45 PM        01-01-16 0:55    NYPD
       1      32309934  12/31/2015 11:59:44 PM        01-01-16 1:26    NYPD
       2      32309159  12/31/2015 11:59:29 PM        01-01-16 4:51    NYPD
       3      32305098  12/31/2015 11:57:46 PM        01-01-16 7:43    NYPD
       4      32306529  12/31/2015 11:56:58 PM        01-01-16 3:24    NYPD
...            ...                     ...                     ...     ...
300693   30281872  03/29/2015 12:33:41 AM                     NaN    NYPD
300694   30281230  03/29/2015 12:33:28 AM  03/29/2015 02:33:59 AM    NYPD
300695   30283424  03/29/2015 12:33:03 AM  03/29/2015 03:40:20 AM    NYPD
300696   30280004  03/29/2015 12:33:02 AM  03/29/2015 04:38:35 AM    NYPD
300697   30281825  03/29/2015 12:33:01 AM  03/29/2015 04:41:50 AM    NYPD

                       agency_name          complaint_type  \
0      New York City Police Department  Noise - Street/Sidewalk
1      New York City Police Department        Blocked Driveway
```

```
2       New York City Police Department          Blocked Driveway
3       New York City Police Department           Illegal Parking
4       New York City Police Department           Illegal Parking
...                              ...                            ...
300693  New York City Police Department          Noise - Commercial
300694  New York City Police Department           Blocked Driveway
300695  New York City Police Department          Noise - Commercial
300696  New York City Police Department          Noise - Commercial
300697  New York City Police Department          Noise - Commercial


                           descriptor          location_type  incident_zip  \
0              Loud Music/Party        Street/Sidewalk         10034.0
1                     No Access        Street/Sidewalk         11105.0
2                     No Access        Street/Sidewalk         10458.0
3       Commercial Overnight Parking  Street/Sidewalk         10461.0
4               Blocked Sidewalk      Street/Sidewalk         11373.0
...                              ...                    ...           ...
300693          Loud Music/Party  Club/Bar/Restaurant           NaN
300694            Partial Access      Street/Sidewalk         11418.0
300695          Loud Music/Party  Club/Bar/Restaurant         11206.0
300696          Loud Music/Party  Club/Bar/Restaurant         10461.0
300697          Loud Music/Party     Store/Commercial         10036.0


                incident_address  … bridge_highway_name  \
0              71 VERMILYEA AVENUE  …                 NaN
1                  27-07 23 AVENUE  …                 NaN
2             2897 VALENTINE AVENUE  …                NaN
3              2940 BAISLEY AVENUE  …                 NaN
4                    87-14 57 ROAD  …                 NaN
...                          …   …                       …
300693           CRESCENT AVENUE  …                 NaN
300694           100-17 87 AVENUE  …                NaN
300695           162 THROOP AVENUE  …                NaN
300696  3151 EAST TREMONT AVENUE  …                 NaN
300697        251 WEST 48 STREET  …                 NaN


        bridge_highway_direction road_ramp bridge_highway_segment  \
0                            NaN       NaN                     NaN
1                            NaN       NaN                     NaN
2                            NaN       NaN                     NaN
3                            NaN       NaN                     NaN
4                            NaN       NaN                     NaN
...                           …         …                       …
300693                       NaN       NaN                     NaN
300694                       NaN       NaN                     NaN
300695                       NaN       NaN                     NaN
300696                       NaN       NaN                     NaN
```

```
300697                      NaN      NaN                  NaN
```

```
        garage_lot_name ferry_direction ferry_terminal_name   latitude  \
0                   NaN             NaN                  NaN  40.865682
1                   NaN             NaN                  NaN  40.775945
2                   NaN             NaN                  NaN  40.870325
3                   NaN             NaN                  NaN  40.835994
4                   NaN             NaN                  NaN  40.733060
…                     …               …                    …          …
300693              NaN             NaN                  NaN        NaN
300694              NaN             NaN                  NaN  40.694077
300695              NaN             NaN                  NaN  40.699590
300696              NaN             NaN                  NaN  40.837708
300697              NaN             NaN                  NaN  40.760583

         longitude                                      location
0       -73.923501    (40.86568153633767, -73.92350095571744)
1       -73.915094   (40.775945312321085, -73.91509393898605)
2       -73.888525   (40.870324522111424, -73.88852464418646)
3       -73.828379    (40.83599404683083, -73.82837939584206)
4       -73.874170   (40.733059618956815, -73.87416975810375)
…                …                                            …
300693        NaN                                          NaN
300694 -73.846087    (40.69407728322387, -73.8460866160573)
300695 -73.944234    (40.69959035300927, -73.94423377144169)
300696 -73.834587     (40.8377075854206, -73.83458731019586)
300697 -73.985922    (40.76058322950115, -73.98592204392392)

[300698 rows x 53 columns]
```

[4]: `#check column names`
`df.columns`

[4]: Index(['unique_key', 'created_date', 'closed_date', 'agency', 'agency_name',
       'complaint_type', 'descriptor', 'location_type', 'incident_zip',
       'incident_address', 'street_name', 'cross_street_1', 'cross_street_2',
       'intersection_street_1', 'intersection_street_2', 'address_type',
       'city', 'landmark', 'facility_type', 'status', 'due_date',
       'resolution_description', 'resolution_action_updated_date',
       'community_board', 'borough', 'x_coordinate_(state_plane)',
       'y_coordinate_(state_plane)', 'park_facility_name', 'park_borough',
       'school_name', 'school_number', 'school_region', 'school_code',
       'school_phone_number', 'school_address', 'school_city', 'school_state',
       'school_zip', 'school_not_found', 'school_or_citywide_complaint',
       'vehicle_type', 'taxi_company_borough', 'taxi_pick_up_location',
       'bridge_highway_name', 'bridge_highway_direction', 'road_ramp',
       'bridge_highway_segment', 'garage_lot_name', 'ferry_direction',

```
                  'ferry_terminal_name', 'latitude', 'longitude', 'location'],
          dtype='object')
```

[5]: ```
     #setting index column
     df=df.set_index(df['unique_key'])
     df
     ```

[5]:
```
              unique_key   created_date   closed_date agency \
unique_key
32310363   32310363 12/31/2015 11:59:45 PM   01-01-16 0:55   NYPD
32309934   32309934 12/31/2015 11:59:44 PM   01-01-16 1:26   NYPD
32309159   32309159 12/31/2015 11:59:29 PM   01-01-16 4:51   NYPD
32305098   32305098 12/31/2015 11:57:46 PM   01-01-16 7:43   NYPD
32306529   32306529 12/31/2015 11:56:58 PM   01-01-16 3:24   NYPD
...   .
30281872   30281872 03/29/2015 12:33:41 AM   NaN   NYPD
30281230   30281230 03/29/2015 12:33:28 AM 03/29/2015 02:33:59 AM   NYPD
30283424   30283424 03/29/2015 12:33:03 AM 03/29/2015 03:40:20 AM   NYPD
30280004   30280004 03/29/2015 12:33:02 AM 03/29/2015 04:38:35 AM   NYPD
30281825   30281825 03/29/2015 12:33:01 AM 03/29/2015 04:41:50 AM   NYPD

                              agency_name   complaint_type \
unique_key
32310363   New York City Police Department Noise - Street/Sidewalk
32309934   New York City Police Department   Blocked Driveway
32309159   New York City Police Department   Blocked Driveway
32305098   New York City Police Department   Illegal Parking
32306529   New York City Police Department   Illegal Parking
...   .
30281872   New York City Police Department   Noise - Commercial
30281230   New York City Police Department   Blocked Driveway
30283424   New York City Police Department   Noise - Commercial
30280004   New York City Police Department   Noise - Commercial
30281825   New York City Police Department   Noise - Commercial

                              descriptor   location_type incident_zip \
unique_key
32310363   Loud Music/Party   Street/Sidewalk   10034.0
32309934   No Access   Street/Sidewalk   11105.0
32309159   No Access   Street/Sidewalk   10458.0
32305098   Commercial Overnight Parking   Street/Sidewalk   10461.0
32306529   Blocked Sidewalk   Street/Sidewalk   11373.0
...   .
30281872   Loud Music/Party Club/Bar/Restaurant   NaN
30281230   Partial Access   Street/Sidewalk   11418.0
30283424   Loud Music/Party Club/Bar/Restaurant   11206.0
30280004   Loud Music/Party Club/Bar/Restaurant   10461.0
```

```
30281825              Loud Music/Party    Store/Commercial       10036.0

                         incident_address  … bridge_highway_name  \
unique_key                                 …
32310363          71 VERMILYEA AVENUE  …                 NaN
32309934              27-07 23 AVENUE  …                 NaN
32309159         2897 VALENTINE AVENUE  …                 NaN
32305098          2940 BAISLEY AVENUE  …                 NaN
32306529               87-14 57 ROAD  …                 NaN
…                               …  …                     …
30281872              CRESCENT AVENUE  …                 NaN
30281230              100-17 87 AVENUE  …                 NaN
30283424              162 THROOP AVENUE  …                 NaN
30280004     3151 EAST TREMONT AVENUE  …                 NaN
30281825            251 WEST 48 STREET  …                 NaN


           bridge_highway_direction road_ramp bridge_highway_segment  \
unique_key
32310363                        NaN       NaN                    NaN
32309934                        NaN       NaN                    NaN
32309159                        NaN       NaN                    NaN
32305098                        NaN       NaN                    NaN
32306529                        NaN       NaN                    NaN
…                               …         …                      …
30281872                        NaN       NaN                    NaN
30281230                        NaN       NaN                    NaN
30283424                        NaN       NaN                    NaN
30280004                        NaN       NaN                    NaN
30281825                        NaN       NaN                    NaN


           garage_lot_name ferry_direction ferry_terminal_name   latitude  \
unique_key
32310363               NaN             NaN                 NaN  40.865682
32309934               NaN             NaN                 NaN  40.775945
32309159               NaN             NaN                 NaN  40.870325
32305098               NaN             NaN                 NaN  40.835994
32306529               NaN             NaN                 NaN  40.733060
…                      …               …                   …          …
30281872               NaN             NaN                 NaN        NaN
30281230               NaN             NaN                 NaN  40.694077
30283424               NaN             NaN                 NaN  40.699590
30280004               NaN             NaN                 NaN  40.837708
30281825               NaN             NaN                 NaN  40.760583


            longitude                                      location
unique_key
32310363    -73.923501    (40.86568153633767, -73.92350095571744)
```

```
32309934    -73.915094   (40.775945312321085, -73.91509393898605)
32309159    -73.888525   (40.870324522111424, -73.88852464418646)
32305098    -73.828379    (40.83599404683083, -73.82837939584206)
32306529    -73.874170   (40.733059618956815, -73.87416975810375)
...                 ...                                        ...
30281872          NaN                                         NaN
30281230    -73.846087    (40.69407728322387, -73.8460866160573)
30283424    -73.944234    (40.69959035300927, -73.94423377144169)
30280004    -73.834587     (40.8377075854206, -73.83458731019586)
30281825    -73.985922   (40.76058322950115, -73.98592204392392)

[300698 rows x 53 columns]
```

[6]:
```python
#dropping duplicated rows
df.drop_duplicates(inplace=True)
df
```

[6]:
```
             unique_key            created_date          closed_date agency  \
unique_key
32310363       32310363  12/31/2015 11:59:45 PM      01-01-16 0:55   NYPD
32309934       32309934  12/31/2015 11:59:44 PM      01-01-16 1:26   NYPD
32309159       32309159  12/31/2015 11:59:29 PM      01-01-16 4:51   NYPD
32305098       32305098  12/31/2015 11:57:46 PM      01-01-16 7:43   NYPD
32306529       32306529  12/31/2015 11:56:58 PM      01-01-16 3:24   NYPD
...                 ...                     ...                 ...    ...
30281872       30281872  03/29/2015 12:33:41 AM                 NaN   NYPD
30281230       30281230  03/29/2015 12:33:28 AM  03/29/2015 02:33:59 AM   NYPD
30283424       30283424  03/29/2015 12:33:03 AM  03/29/2015 03:40:20 AM   NYPD
30280004       30280004  03/29/2015 12:33:02 AM  03/29/2015 04:38:35 AM   NYPD
30281825       30281825  03/29/2015 12:33:01 AM  03/29/2015 04:41:50 AM   NYPD

                            agency_name         complaint_type  \
unique_key
32310363    New York City Police Department  Noise - Street/Sidewalk
32309934    New York City Police Department         Blocked Driveway
32309159    New York City Police Department         Blocked Driveway
32305098    New York City Police Department          Illegal Parking
32306529    New York City Police Department          Illegal Parking
...                                     ...                      ...
30281872    New York City Police Department        Noise - Commercial
30281230    New York City Police Department         Blocked Driveway
30283424    New York City Police Department        Noise - Commercial
30280004    New York City Police Department        Noise - Commercial
30281825    New York City Police Department        Noise - Commercial

                        descriptor     location_type  incident_zip  \
unique_key
```

```
32310363              Loud Music/Party     Street/Sidewalk     10034.0
32309934                    No Access      Street/Sidewalk     11105.0
32309159                    No Access      Street/Sidewalk     10458.0
32305098    Commercial Overnight Parking   Street/Sidewalk     10461.0
32306529              Blocked Sidewalk     Street/Sidewalk     11373.0
…                             …                   …             …
30281872              Loud Music/Party  Club/Bar/Restaurant        NaN
30281230                Partial Access     Street/Sidewalk     11418.0
30283424              Loud Music/Party  Club/Bar/Restaurant     11206.0
30280004              Loud Music/Party  Club/Bar/Restaurant     10461.0
30281825              Loud Music/Party     Store/Commercial    10036.0


                     incident_address  … bridge_highway_name  \
unique_key                              …
32310363         71 VERMILYEA AVENUE   …                 NaN
32309934           27-07 23 AVENUE     …                 NaN
32309159      2897 VALENTINE AVENUE    …                 NaN
32305098       2940 BAISLEY AVENUE     …                 NaN
32306529            87-14 57 ROAD      …                 NaN
…                        …   …                         …
30281872          CRESCENT AVENUE      …                 NaN
30281230          100-17 87 AVENUE     …                 NaN
30283424          162 THROOP AVENUE    …                 NaN
30280004   3151 EAST TREMONT AVENUE    …                 NaN
30281825         251 WEST 48 STREET    …                 NaN


           bridge_highway_direction road_ramp bridge_highway_segment  \
unique_key
32310363                        NaN       NaN                    NaN
32309934                        NaN       NaN                    NaN
32309159                        NaN       NaN                    NaN
32305098                        NaN       NaN                    NaN
32306529                        NaN       NaN                    NaN
…                                …         …                      …
30281872                        NaN       NaN                    NaN
30281230                        NaN       NaN                    NaN
30283424                        NaN       NaN                    NaN
30280004                        NaN       NaN                    NaN
30281825                        NaN       NaN                    NaN


           garage_lot_name ferry_direction ferry_terminal_name   latitude  \
unique_key
32310363               NaN             NaN                 NaN  40.865682
32309934               NaN             NaN                 NaN  40.775945
32309159               NaN             NaN                 NaN  40.870325
32305098               NaN             NaN                 NaN  40.835994
32306529               NaN             NaN                 NaN  40.733060
```

```
...                              ...           ...                    ...         ...
30281872                         NaN           NaN                    NaN         NaN
30281230                         NaN           NaN                    NaN    40.694077
30283424                         NaN           NaN                    NaN    40.699590
30280004                         NaN           NaN                    NaN    40.837708
30281825                         NaN           NaN                    NaN    40.760583

              longitude                                   location
unique_key
32310363    -73.923501    (40.86568153633767, -73.92350095571744)
32309934    -73.915094   (40.775945312321085, -73.91509393898605)
32309159    -73.888525   (40.870324522111424, -73.88852464418646)
32305098    -73.828379    (40.83599404683083, -73.82837939584206)
32306529    -73.874170   (40.733059618956815, -73.87416975810375)
...                 ...                                        ...
30281872          NaN                                         NaN
30281230    -73.846087    (40.69407728322387, -73.8460866160573)
30283424    -73.944234   (40.69959035300927, -73.94423377144169)
30280004    -73.834587    (40.8377075854206, -73.83458731019586)
30281825    -73.985922   (40.76058322950115, -73.98592204392392)

[300698 rows x 53 columns]
```

[7]:
```python
#checking the info about of each column of the dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 300698 entries, 32310363 to 30281825
Data columns (total 53 columns):
 #   Column                 Non-Null Count   Dtype
---  ------                 --------------   -----
 0   unique_key             300698 non-null  int64
 1   created_date           300698 non-null  object
 2   closed_date            298534 non-null  object
 3   agency                 300698 non-null  object
 4   agency_name            300698 non-null  object
 5   complaint_type         300698 non-null  object
 6   descriptor             294784 non-null  object
 7   location_type          300567 non-null  object
 8   incident_zip           298083 non-null  float64
 9   incident_address       256288 non-null  object
 10  street_name            256288 non-null  object
 11  cross_street_1         251419 non-null  object
 12  cross_street_2         250919 non-null  object
 13  intersection_street_1  43858 non-null   object
 14  intersection_street_2  43362 non-null   object
 15  address_type           297883 non-null  object
```

```
 16   city                              298084 non-null   object
 17   landmark                          349 non-null      object
 18   facility_type                     298527 non-null   object
 19   status                            300698 non-null   object
 20   due_date                          300695 non-null   object
 21   resolution_description            300698 non-null   object
 22   resolution_action_updated_date    298511 non-null   object
 23   community_board                   300698 non-null   object
 24   borough                           300698 non-null   object
 25   x_coordinate_(state_plane)        297158 non-null   float64
 26   y_coordinate_(state_plane)        297158 non-null   float64
 27   park_facility_name                300698 non-null   object
 28   park_borough                      300698 non-null   object
 29   school_name                       300698 non-null   object
 30   school_number                     300698 non-null   object
 31   school_region                     300697 non-null   object
 32   school_code                       300697 non-null   object
 33   school_phone_number               300698 non-null   object
 34   school_address                    300698 non-null   object
 35   school_city                       300698 non-null   object
 36   school_state                      300698 non-null   object
 37   school_zip                        300697 non-null   object
 38   school_not_found                  300698 non-null   object
 39   school_or_citywide_complaint      0 non-null        float64
 40   vehicle_type                      0 non-null        float64
 41   taxi_company_borough              0 non-null        float64
 42   taxi_pick_up_location             0 non-null        float64
 43   bridge_highway_name               243 non-null      object
 44   bridge_highway_direction          243 non-null      object
 45   road_ramp                         213 non-null      object
 46   bridge_highway_segment            213 non-null      object
 47   garage_lot_name                   0 non-null        float64
 48   ferry_direction                   1 non-null        object
 49   ferry_terminal_name               2 non-null        object
 50   latitude                          297158 non-null   float64
 51   longitude                         297158 non-null   float64
 52   location                          297158 non-null   object
dtypes: float64(10), int64(1), object(42)
memory usage: 123.9+ MB
```

[8]:
```python
#changing the datatype of creted_date and closed_date
df['created_date']=pd.to_datetime(df['created_date'])
df['closed_date']=pd.to_datetime(df['closed_date'])
```

[9]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 300698 entries, 32310363 to 30281825
```

```
Data columns (total 53 columns):
 #   Column                         Non-Null Count    Dtype
---  ------                         --------------    -----
 0   unique_key                     300698 non-null   int64
 1   created_date                   300698 non-null   datetime64[ns]
 2   closed_date                    298534 non-null   datetime64[ns]
 3   agency                         300698 non-null   object
 4   agency_name                    300698 non-null   object
 5   complaint_type                 300698 non-null   object
 6   descriptor                     294784 non-null   object
 7   location_type                  300567 non-null   object
 8   incident_zip                   298083 non-null   float64
 9   incident_address               256288 non-null   object
 10  street_name                    256288 non-null   object
 11  cross_street_1                 251419 non-null   object
 12  cross_street_2                 250919 non-null   object
 13  intersection_street_1          43858 non-null    object
 14  intersection_street_2          43362 non-null    object
 15  address_type                   297883 non-null   object
 16  city                           298084 non-null   object
 17  landmark                       349 non-null      object
 18  facility_type                  298527 non-null   object
 19  status                         300698 non-null   object
 20  due_date                       300695 non-null   object
 21  resolution_description         300698 non-null   object
 22  resolution_action_updated_date 298511 non-null   object
 23  community_board                300698 non-null   object
 24  borough                        300698 non-null   object
 25  x_coordinate_(state_plane)     297158 non-null   float64
 26  y_coordinate_(state_plane)     297158 non-null   float64
 27  park_facility_name             300698 non-null   object
 28  park_borough                   300698 non-null   object
 29  school_name                    300698 non-null   object
 30  school_number                  300698 non-null   object
 31  school_region                  300697 non-null   object
 32  school_code                    300697 non-null   object
 33  school_phone_number            300698 non-null   object
 34  school_address                 300698 non-null   object
 35  school_city                    300698 non-null   object
 36  school_state                   300698 non-null   object
 37  school_zip                     300697 non-null   object
 38  school_not_found               300698 non-null   object
 39  school_or_citywide_complaint   0 non-null        float64
 40  vehicle_type                   0 non-null        float64
 41  taxi_company_borough           0 non-null        float64
 42  taxi_pick_up_location          0 non-null        float64
 43  bridge_highway_name            243 non-null      object
 44  bridge_highway_direction       243 non-null      object
```

```
 45   road_ramp                          213 non-null     object
 46   bridge_highway_segment             213 non-null     object
 47   garage_lot_name                      0 non-null     float64
 48   ferry_direction                      1 non-null     object
 49   ferry_terminal_name                  2 non-null     object
 50   latitude                        297158 non-null     float64
 51   longitude                       297158 non-null     float64
 52   location                        297158 non-null     object
dtypes: datetime64[ns](2), float64(10), int64(1), object(40)
memory usage: 123.9+ MB
```

[10]:
```python
#calculating the Request_Closing_Time in terms of hours
def req_closing_time(df):
    df['request_closing_time']=((df['closed_date']-df['created_date']).dt.
 ↪seconds/60)/60
    df1=df[df['request_closing_time'].notnull()] #avoiding not null
    df_close_time=df1[df1['closed_date']>=df1['created_date']]
    return df_close_time

df_new=req_closing_time(df)
df_new
```

[10]:
```
              unique_key         created_date         closed_date agency  \
unique_key
32310363        32310363 2015-12-31 23:59:45 2016-01-01 00:55:00   NYPD
32309934        32309934 2015-12-31 23:59:44 2016-01-01 01:26:00   NYPD
32309159        32309159 2015-12-31 23:59:29 2016-01-01 04:51:00   NYPD
32305098        32305098 2015-12-31 23:57:46 2016-01-01 07:43:00   NYPD
32306529        32306529 2015-12-31 23:56:58 2016-01-01 03:24:00   NYPD
...                  ...                 ...                 ...    ...
30281370        30281370 2015-03-29 00:34:32 2015-03-29 01:13:01   NYPD
30281230        30281230 2015-03-29 00:33:28 2015-03-29 02:33:59   NYPD
30283424        30283424 2015-03-29 00:33:03 2015-03-29 03:40:20   NYPD
30280004        30280004 2015-03-29 00:33:02 2015-03-29 04:38:35   NYPD
30281825        30281825 2015-03-29 00:33:01 2015-03-29 04:41:50   NYPD

                                 agency_name          complaint_type  \
unique_key
32310363     New York City Police Department   Noise - Street/Sidewalk
32309934     New York City Police Department           Blocked Driveway
32309159     New York City Police Department           Blocked Driveway
32305098     New York City Police Department            Illegal Parking
32306529     New York City Police Department            Illegal Parking
...                                      ...                        ...
30281370     New York City Police Department          Noise - Commercial
30281230     New York City Police Department            Blocked Driveway
30283424     New York City Police Department          Noise - Commercial
```

```
30280004    New York City Police Department      Noise - Commercial
30281825    New York City Police Department      Noise - Commercial

                               descriptor        location_type   incident_zip  \
unique_key
32310363              Loud Music/Party       Street/Sidewalk       10034.0
32309934                    No Access        Street/Sidewalk       11105.0
32309159                    No Access        Street/Sidewalk       10458.0
32305098    Commercial Overnight Parking     Street/Sidewalk       10461.0
32306529             Blocked Sidewalk        Street/Sidewalk       11373.0
...                                ...                   ...            ...
30281370              Loud Music/Party       Store/Commercial      10002.0
30281230               Partial Access        Street/Sidewalk       11418.0
30283424              Loud Music/Party    Club/Bar/Restaurant      11206.0
30280004              Loud Music/Party    Club/Bar/Restaurant      10461.0
30281825              Loud Music/Party       Store/Commercial      10036.0

                   incident_address   …  bridge_highway_direction road_ramp  \
unique_key                             …
32310363        71 VERMILYEA AVENUE   …                       NaN       NaN
32309934          27-07 23 AVENUE     …                       NaN       NaN
32309159       2897 VALENTINE AVENUE  …                       NaN       NaN
32305098        2940 BAISLEY AVENUE   …                       NaN       NaN
32306529            87-14 57 ROAD     …                       NaN       NaN
...                           ...  …  …                       …         …
30281370            81 HESTER STREET  …                       NaN       NaN
30281230           100-17 87 AVENUE   …                       NaN       NaN
30283424            162 THROOP AVENUE  …                      NaN       NaN
30280004    3151 EAST TREMONT AVENUE  …                       NaN       NaN
30281825           251 WEST 48 STREET  …                      NaN       NaN

           bridge_highway_segment garage_lot_name ferry_direction  \
unique_key
32310363                      NaN             NaN             NaN
32309934                      NaN             NaN             NaN
32309159                      NaN             NaN             NaN
32305098                      NaN             NaN             NaN
32306529                      NaN             NaN             NaN
...                           …               …               …
30281370                      NaN             NaN             NaN
30281230                      NaN             NaN             NaN
30283424                      NaN             NaN             NaN
30280004                      NaN             NaN             NaN
30281825                      NaN             NaN             NaN

           ferry_terminal_name   latitude   longitude  \
unique_key
```

```
32310363                NaN  40.865682 -73.923501
32309934                NaN  40.775945 -73.915094
32309159                NaN  40.870325 -73.888525
32305098                NaN  40.835994 -73.828379
32306529                NaN  40.733060 -73.874170
...                      ...       ...        ...
30281370                NaN  40.716053 -73.991378
30281230                NaN  40.694077 -73.846087
30283424                NaN  40.699590 -73.944234
30280004                NaN  40.837708 -73.834587
30281825                NaN  40.760583 -73.985922


                                          location request_closing_time
unique_key
32310363    (40.86568153633767, -73.92350095571744)             0.920833
32309934   (40.775945312321085, -73.91509393898605)             1.437778
32309159   (40.870324522111424, -73.88852464418646)             4.858611
32305098    (40.83599404683083, -73.82837939584206)             7.753889
32306529   (40.733059618956815, -73.87416975810375)             3.450556
...                                              ...                  ...
30281370    (40.71605290789855, -73.99137850370803)             0.641389
30281230     (40.69407728322387, -73.8460866160573)             2.008611
30283424    (40.69959035300927, -73.94423377144169)             3.121389
30280004     (40.8377075854206, -73.83458731019586)             4.092500
30281825   (40.76058322950115, -73.98592204392392)             4.146944

[298534 rows x 54 columns]
```

```python
#most common complains

common_complaints=pd.DataFrame(df_new.
 ↪groupby('complaint_type')['complaint_type'].count().
 ↪sort_values(ascending=False)).rename(columns={'complaint_type':'counts'})
common_complaints
```

```
[11]:                         counts
      complaint_type
      Blocked Driveway         76810
      Illegal Parking          74532
      Noise - Street/Sidewalk  48076
      Noise - Commercial       35247
      Derelict Vehicle         17588
      Noise - Vehicle          17033
      Animal Abuse              7768
      Traffic                   4496
      Homeless Encampment       4416
      Noise - Park              4022
```

```
Vending                      3795
Drinking                     1275
Noise - House of Worship      929
Posting Advertisement         648
Urinating in Public           592
Bike/Roller/Skate Chronic     424
Panhandling                   305
Disorderly Youth              286
Illegal Fireworks             168
Graffiti                      113
Agency Issues                   6
Squeegee                        4
Animal in a Park                1
```

[12]: `common_complaints.shape`

[12]: (23, 1)

[13]:
```python
#visualizing most complaint types
common_complaints.head(15).plot(kind='bar',
                    figsize=(10,6),
                    title="Most Common Complaints")
```

[13]: <AxesSubplot:title={'center':'Most Common Complaints'}, xlabel='complaint_type'>

Most Common Complaints
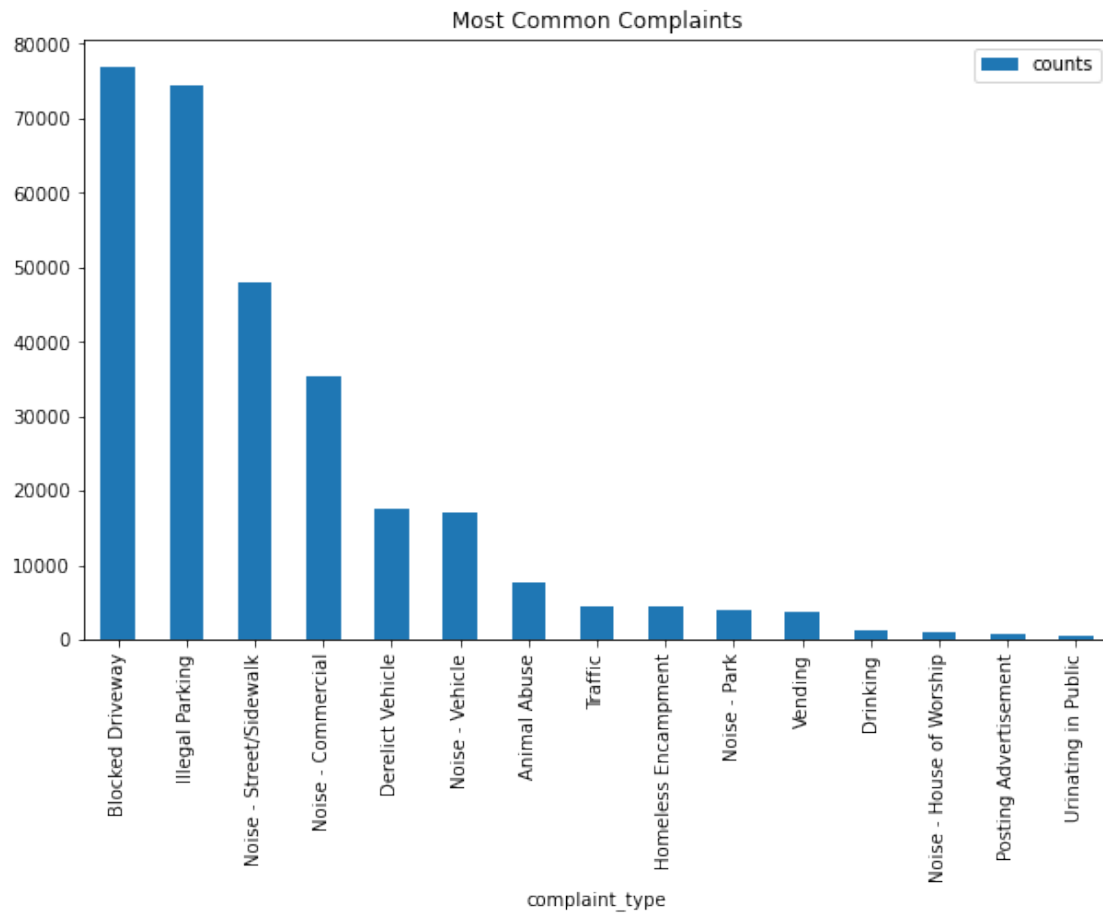
```
[14]: #visualizing least complaint types
      common_complaints.tail(15).plot(kind='bar',
                         figsize=(10,6),
                         title="Least Common Complaints")
```

```
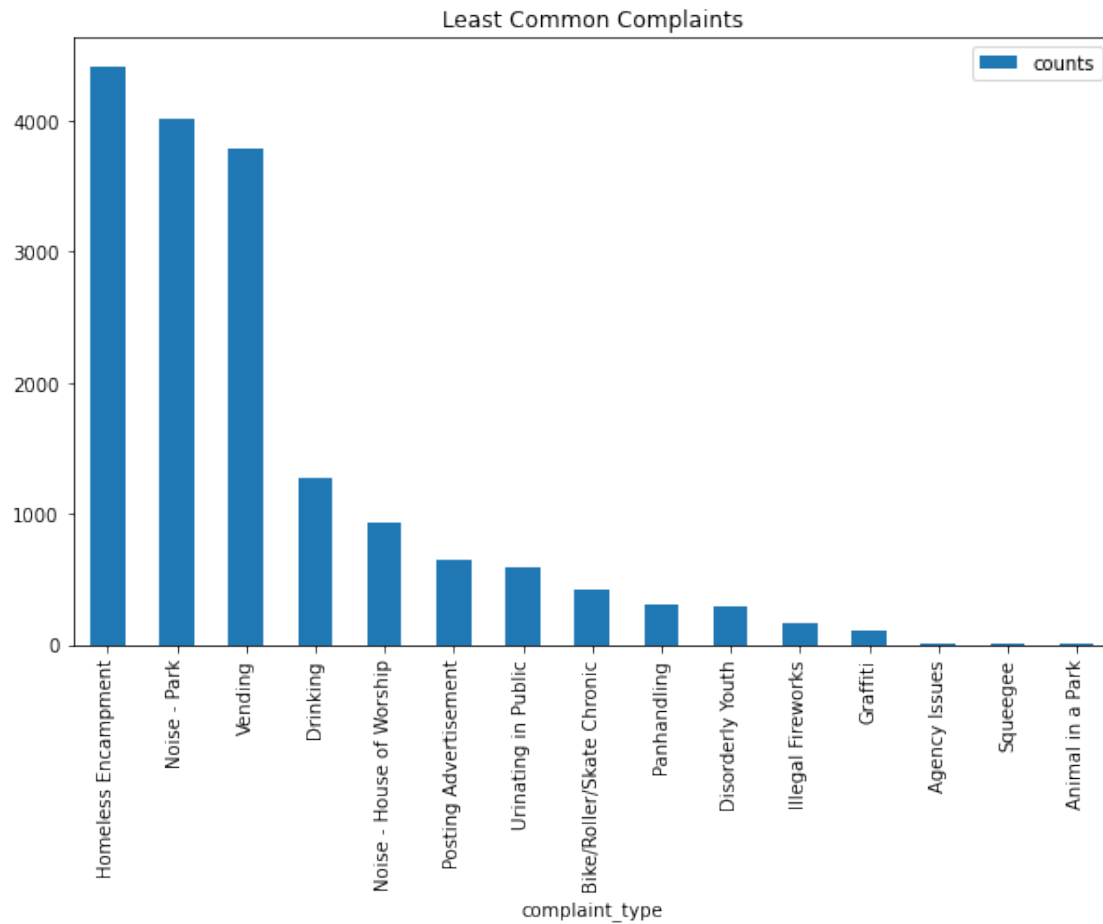[14]: <AxesSubplot:title={'center':'Least Common Complaints'},
      xlabel='complaint_type'>
```

17

Least Common Complaints


```
[15]: #finding total complains from a community board
      borough_complaints=pd.DataFrame(df_new.groupby('borough')['complaint_type'].
      ↪count().sort_values(ascending=False)).rename(columns={'complaint_type':
      ↪'complaint_counts'})
      borough_complaints
```

```
[15]:                complaint_counts
      borough
      BROOKLYN                  98295
      QUEENS                    80629
      MANHATTAN                 66109
      BRONX                     40697
      STATEN ISLAND             12338
      Unspecified                 466
```

```
[16]: #plotting a pie chart for showing % of complains from a community board
      borough_complaints.plot(kind='pie',
                              autopct='%1.1f%%',
```

```
                     startangle=30,
                     figsize=(10,8),
                    subplots=True)
```

[16]: array([<AxesSubplot:ylabel='complaint_counts'>], dtype=object)
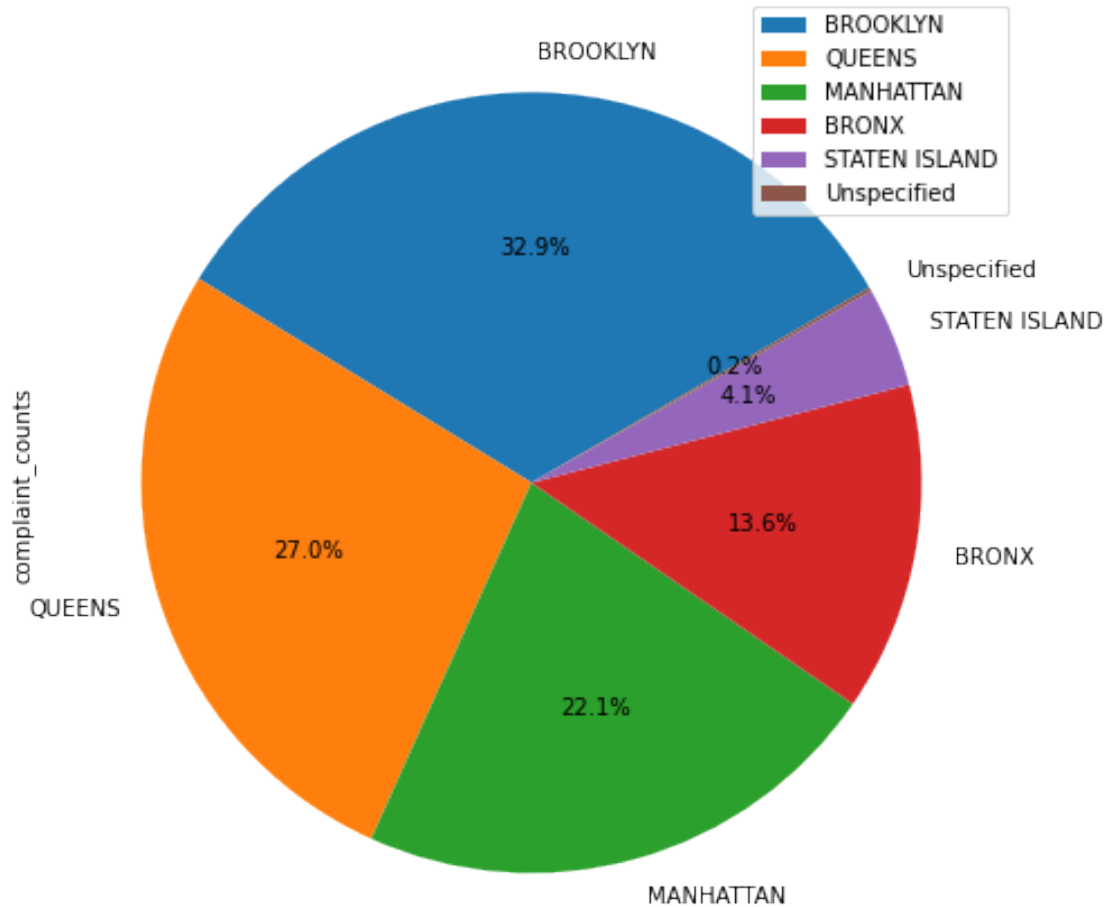
[17]: ```
      #average response type o complain
      avg_res=pd.DataFrame(df_new.groupby('complaint_type')['request_closing_time'].
       mean().sort_values(ascending=False)).rename(columns={'request_closing_time':
       'average_response_time'})
      avg_res
      ```

[17]:   average_response_time
      complaint_type
      Graffiti   5.664526
      Derelict Vehicle   5.588838

```
Agency Issues                  5.260324
Animal Abuse                   4.626220
Blocked Driveway               4.384702
Illegal Parking                4.143077
Homeless Encampment            4.099266
Squeegee                       4.045625
Vending                        3.805223
Panhandling                    3.743260
Drinking                       3.617127
Bike/Roller/Skate Chronic      3.540047
Disorderly Youth               3.474668
Urinating in Public            3.423962
Noise - Vehicle                3.376230
Noise - Park                   3.255586
Noise - Street/Sidewalk        3.221578
Traffic                        3.197791
Noise - Commercial             2.991226
Noise - House of Worship       2.960790
Illegal Fireworks              2.618282
Posting Advertisement          1.938766
Animal in a Park               0.834722
```

[18]:
```python
#plotting the average response time of a complain
avg_res.plot(kind='bar',
            xlabel="Complaint Types",
            ylabel="Average Response Time",
            title="Average Response Time of Complains",
            figsize=(12,12))
```

[18]: <AxesSubplot:title={'center':'Average Response Time of Complains'},
      xlabel='Complaint Types', ylabel='Average Response Time'>

Average Response Time of Complains
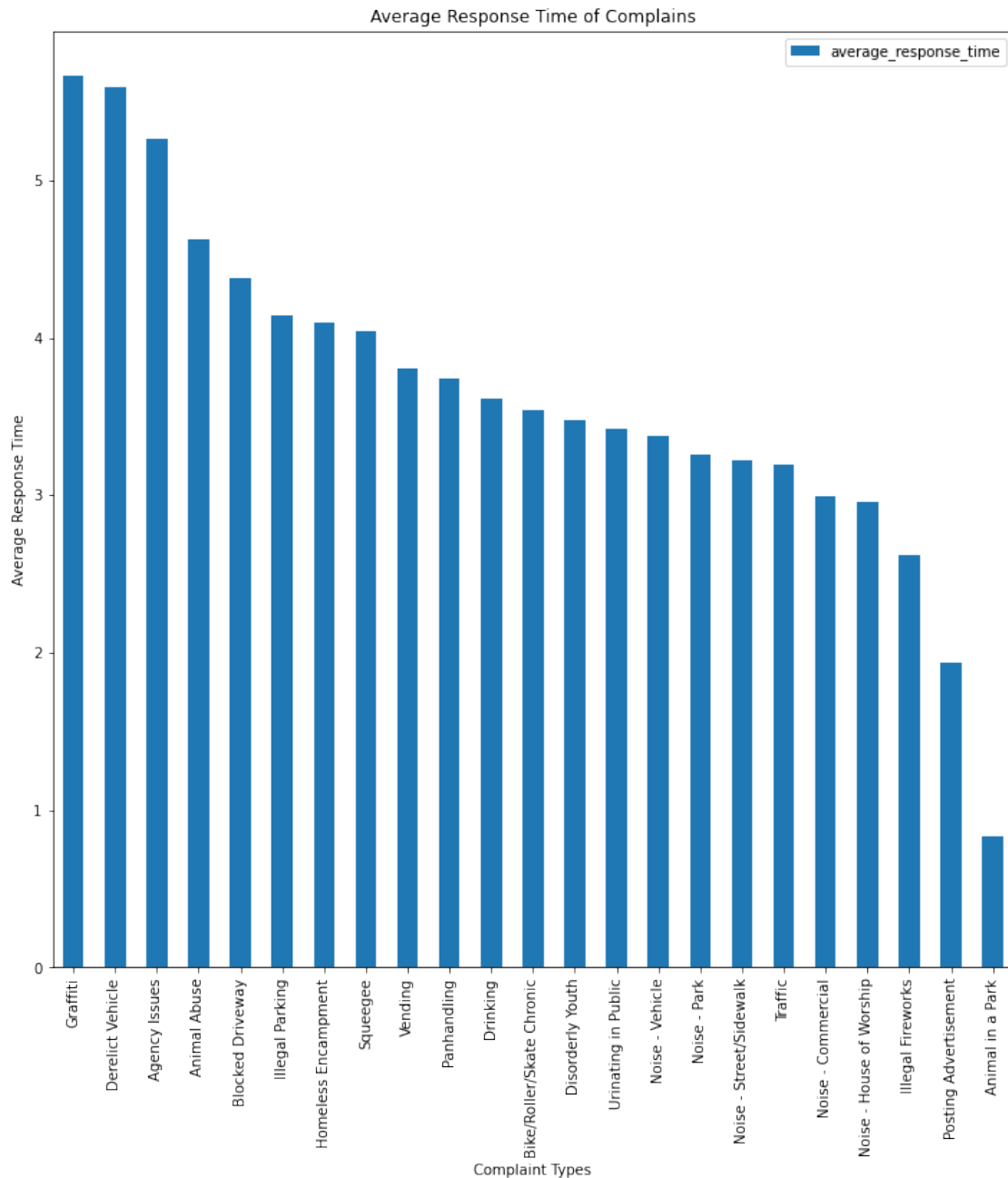

```
[19]: #finding the total complains from a location type
      loc_complain=pd.DataFrame(df_new.groupby('location_type')['location_type'].
       ↪count().sort_values(ascending=False)).rename(columns={'locatiob_type':
       ↪'total_complain'})
      loc_complain
```

```
[19]:                             location_type
      location_type
      Street/Sidewalk                    247503
      Store/Commercial                    20183
      Club/Bar/Restaurant                 17227
      Residential Building/House           6953
      Park/Playground                      4751
      House of Worship                      927
      Residential Building                  227
      Highway                               214
      Parking Lot                           117
      House and Store                        93
      Vacant Lot                             77
      Commercial                             62
      Roadway Tunnel                         35
      Subway Station                         34
      Bridge                                  2
      Park                                    1
```

```python
[20]: #ploting a graph between location type and total complain
      loc_complain.plot(kind='bar',
                        title="Location Type VS Complain",
                        figsize=(10,10))
```

```
[20]: <AxesSubplot:title={'center':'Location Type VS Complain'},
      xlabel='location_type'>
```

Location Type VS Complain
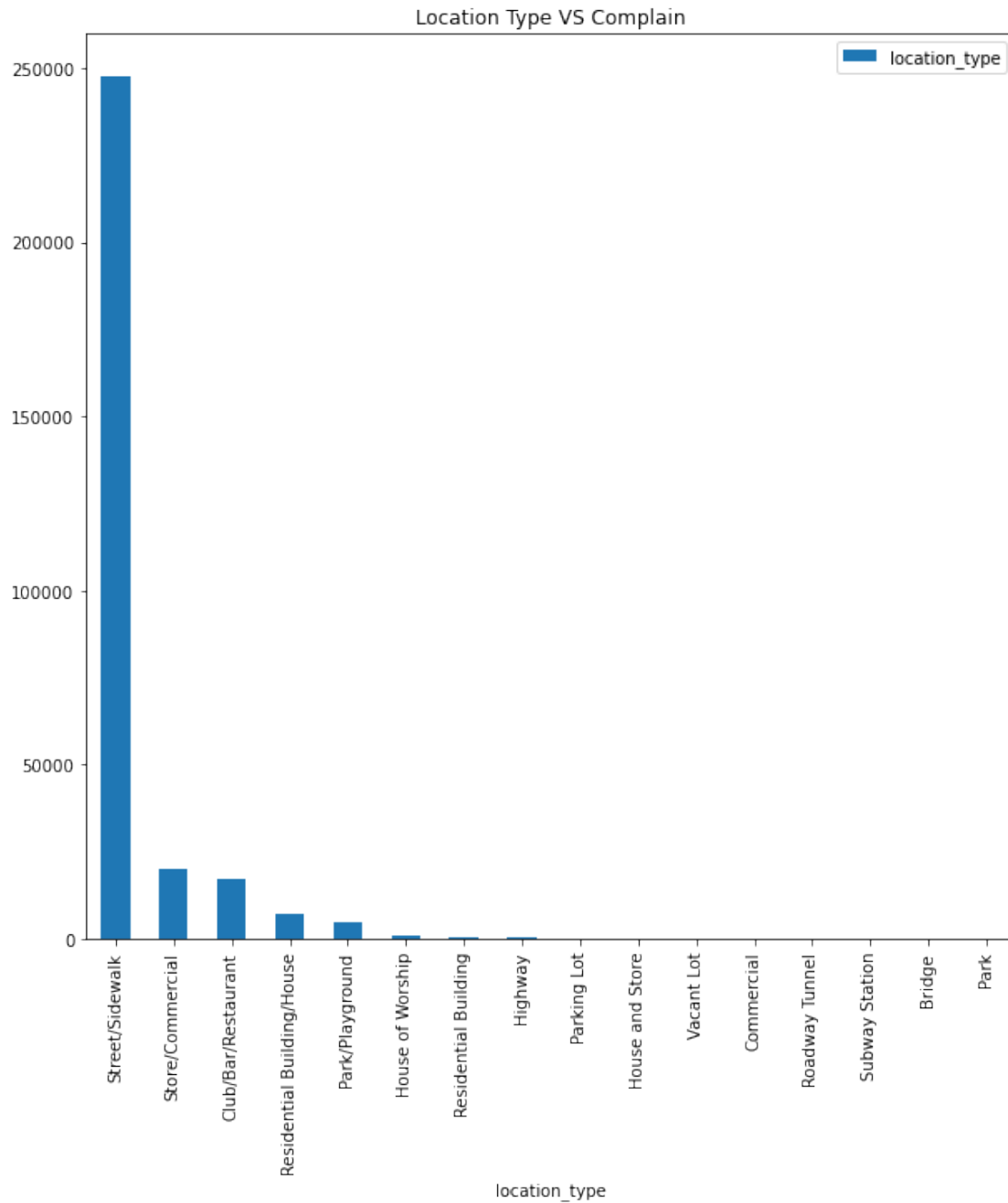
```
[21]:  #Ordering the complaint types based on the average 'Request_Closing_Time',␣
       ↪grouping them for different locations.
       complaint_type=pd.DataFrame(df_new.
       ↪groupby(['location_type','complaint_type'])['request_closing_time'].mean())
       complaint_type
```

```
[21]:                                          request_closing_time
      location_type        complaint_type
      Bridge               Homeless Encampment              3.819306
      Club/Bar/Restaurant  Drinking                         4.019785
                           Noise - Commercial               2.891485
                           Urinating in Public              4.491429
      Commercial           Animal Abuse                     4.568575
      ...                                                        ...
      Street/Sidewalk      Urinating in Public              3.209283
                           Vending                          3.791013
      Subway Station       Animal Abuse                     3.035606
                           Urinating in Public              1.152130
      Vacant Lot           Derelict Vehicle                 4.045354

      [69 rows x 1 columns]
```

```
[22]: # doing statistical test to accept or reject the Null Hypothesis along with the␣
      ↪corresponding 'p-value'
```

```
[23]: #taking sample n=3000 from df_new data set

      df_sample=df_new.sample(n=3000)
      df_sample
```

```
[23]:               unique_key        created_date         closed_date agency  \
      unique_key
      30798380        30798380 2015-06-08 17:32:00 2015-06-08 19:17:00   NYPD
      31416544        31416544 2015-08-29 22:25:53 2015-08-30 02:59:10   NYPD
      32111871        32111871 2015-12-02 20:57:00 2015-12-03 01:21:00   NYPD
      30762338        30762338 2015-06-03 09:44:00 2015-06-03 10:25:00   NYPD
      32024879        32024879 2015-11-19 05:48:52 2015-11-19 07:40:24   NYPD
      ...                  ...                 ...                 ...    ...
      31836267        31836267 2015-10-23 16:30:35 2015-10-23 23:55:50   NYPD
      30523847        30523847 2015-05-01 23:40:00 2015-05-01 23:46:00   NYPD
      31967830        31967830 2015-11-12 10:48:00 2015-11-12 12:13:00   NYPD
      31911357        31911357 2015-11-04 09:00:00 2015-11-04 16:14:00   NYPD
      30750159        30750159 2015-06-01 08:16:00 2015-06-01 09:47:00   NYPD

                                    agency_name          complaint_type  \
      unique_key
      30798380    New York City Police Department         Illegal Parking
      31416544    New York City Police Department   Noise - Street/Sidewalk
      32111871    New York City Police Department         Illegal Parking
      30762338    New York City Police Department                 Traffic
      32024879    New York City Police Department         Blocked Driveway
      ...                                     ...                     ...
      31836267    New York City Police Department             Animal Abuse
```

```
30523847    New York City Police Department      Noise - Commercial
31967830    New York City Police Department    Urinating in Public
31911357    New York City Police Department       Blocked Driveway
30750159    New York City Police Department       Blocked Driveway


                                descriptor          location_type  \
unique_key
30798380    Commercial Overnight Parking         Street/Sidewalk
31416544             Loud Music/Party            Street/Sidewalk
32111871             Blocked Hydrant             Street/Sidewalk
30762338           Congestion/Gridlock           Street/Sidewalk
32024879                  No Access              Street/Sidewalk
…                           …                          …
31836267                  Neglected   Residential Building/House
30523847             Loud Music/Party             Store/Commercial
31967830                       NaN                Street/Sidewalk
31911357                  No Access              Street/Sidewalk
30750159                  No Access              Street/Sidewalk


            incident_zip      incident_address  … bridge_highway_direction  \
unique_key                                     …
30798380       11211.0      49 WITHERS STREET  …                       NaN
31416544       11103.0                    NaN  …                       NaN
32111871       10028.0      123 EAST 86 STREET  …                      NaN
30762338       10065.0                    NaN  …                       NaN
32024879       11372.0      37-14 91 STREET    …                       NaN
…                  …             …        …                           …
31836267       10032.0      638 WEST 160 STREET  …                     NaN
30523847       10012.0      162 BLEECKER STREET  …                     NaN
31967830       10012.0        SULLIVAN STREET  …                       NaN
31911357       11223.0      2251 WEST 1 STREET  …                      NaN
30750159       11238.0  381 VANDERBILT AVENUE  …                       NaN


            road_ramp bridge_highway_segment garage_lot_name ferry_direction  \
unique_key
30798380        NaN                    NaN             NaN             NaN
31416544        NaN                    NaN             NaN             NaN
32111871        NaN                    NaN             NaN             NaN
30762338        NaN                    NaN             NaN             NaN
32024879        NaN                    NaN             NaN             NaN
…                …                      …               …               …
31836267        NaN                    NaN             NaN             NaN
30523847        NaN                    NaN             NaN             NaN
31967830        NaN                    NaN             NaN             NaN
31911357        NaN                    NaN             NaN             NaN
30750159        NaN                    NaN             NaN             NaN
```

```
        ferry_terminal_name   latitude  longitude   \
unique_key
30798380                NaN  40.716811 -73.950745
31416544                NaN  40.766606 -73.916102
32111871                NaN  40.779800 -73.956281
30762338                NaN  40.764106 -73.966814
32024879                NaN  40.750126 -73.875866
...                     ...        ...        ...
31836267                NaN  40.836616 -73.945174
30523847                NaN  40.728602 -74.000065
31967830                NaN  40.727040 -74.001901
31911357                NaN  40.593578 -73.971738
30750159                NaN  40.686839 -73.968565

                                            location request_closing_time
unique_key
30798380    (40.71681122720942, -73.95074508128886)             1.750000
31416544    (40.76660569938249, -73.91610222233327)             4.554722
32111871    (40.779799952173455, -73.9562807458577)             4.400000
30762338   (40.764106304488124, -73.96681397472976)             0.683333
32024879    (40.75012559409038, -73.87586631504297)             1.858889
...                                              ...                  ...
31836267   (40.836616474714596, -73.94517416195346)             7.420833
30523847    (40.72860226543579, -74.00006494399899)             0.100000
31967830     (40.7270404834725, -74.0019013714094)             1.416667
31911357   (40.593577633002255, -73.97173807219585)             7.233333
30750159    (40.68683913968196, -73.96856515623011)             1.516667

[3000 rows x 54 columns]
```

[24]:
```python
#finding average response time for request_closing_time
avg_res_time= df_new['request_closing_time'].mean()
avg_res_time
```

[24]: 3.929396621862499

[25]:
```python
#cheking the shape of sample
df_sample.shape
```

[25]: (3000, 54)

[26]:
```python
#Shapiro-Wilk Test of Normality
#HO: request_closing_time is normal

from scipy.stats import shapiro
stat,p= shapiro(df_sample.request_closing_time)
```

```
print(stat, p)
```

0.7971596717834473 0.0

As P-value=0.0 which is less than 0.05, we can reject the null hypothesis and there is evidence that data is not normally distributed population.

```
[27]: #lets check for QQPlot

      import statsmodels.api as sm
      import pylab
      sm.qqplot(df_sample.request_closing_time,
                line='s')
      pylab.show()
```
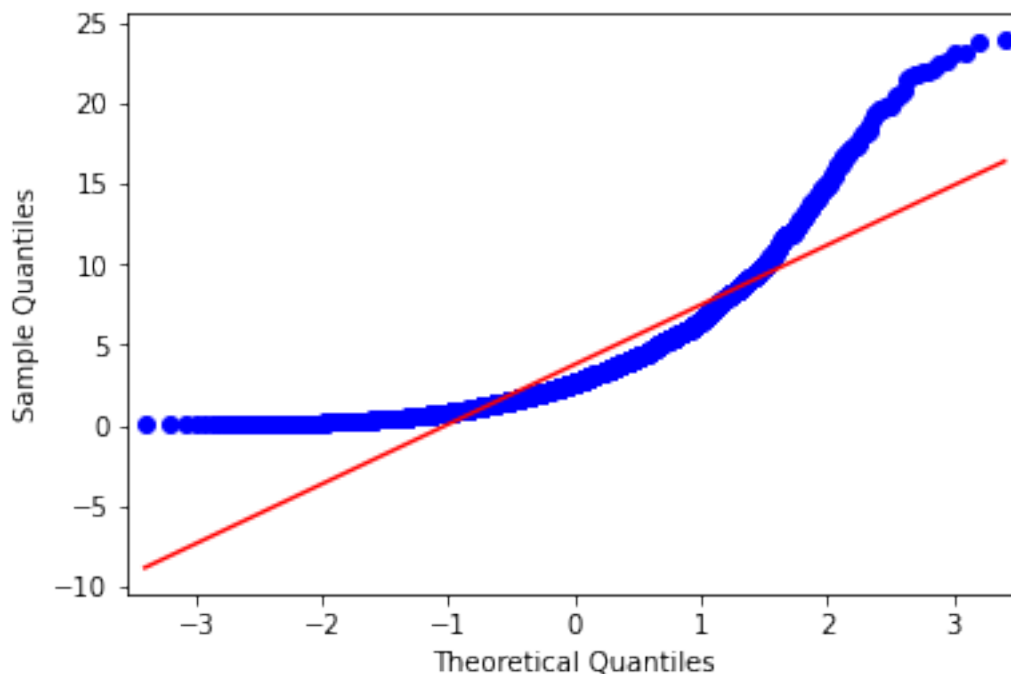

The above QQplot shows that the data is not normally distributed.

So, to check whether the average response time across complaint type are similar or not, we have to use non parametric test

Krushal Walis H Test

Reject H0: One or more samples are not equal

Fail to reject H0: All sample distribution are equal

```
[28]: complaint_types=df_new['complaint_type'].unique()
      complaint_types
```

```
[28]: array(['Noise - Street/Sidewalk', 'Blocked Driveway', 'Illegal Parking',
             'Derelict Vehicle', 'Noise - Commercial',
             'Noise - House of Worship', 'Posting Advertisement',
             'Noise - Vehicle', 'Animal Abuse', 'Vending', 'Traffic',
             'Drinking', 'Bike/Roller/Skate Chronic', 'Panhandling',
             'Noise - Park', 'Homeless Encampment', 'Urinating in Public',
             'Graffiti', 'Disorderly Youth', 'Illegal Fireworks',
             'Agency Issues', 'Squeegee', 'Animal in a Park'], dtype=object)
```

```
[29]: len(complaint_types)
```

```
[29]: 23
```

```
[30]: new=[]
      for i in complaint_types:
          new.append(df_new.loc[df_new['complaint_type']==i]['request_closing_time'].
       ↪ravel())
```

```
[31]: #Krushal Walis H Test

      from scipy.stats import kruskal
      stat,p= kruskal(new[0], new[1], new[2], new[3], new[4], new[5], new[6], new[7],␣
       ↪new[8], new[9], new[10], new[11], new[12], new[13], new[14], new[15],␣
       ↪new[16], new[17], new[18], new[19], new[20], new[21], new[22])
      print(stat, p)
```

```
9982.384091190823 0.0
```

```
[32]: if p>0.05:
          print("Fail to reject H0. \nThe mean average response time across complaint␣
       ↪type are similar")
      else:
          print("reject H0. \nThe mean average response time across complaint type␣
       ↪are not similar")
```

```
reject H0.
The mean average response time across complaint type are not similar
```

now checking is the type of complaint or service requested or location related

Chi-Square Test of independence

H0: There is no statistically relationship between city and complaint type

H1: There is a statistically relationship between city and complaint type

```
[33]: #contingency table for complaints
      cont_table=pd.crosstab(df_new['city'],df_new['complaint_type'], margins=True)
      cont_table
```

```
[33]: complaint_type      Animal Abuse  Animal in a Park  \
      city
      ARVERNE                        38                 0
      ASTORIA                       125                 0
      Astoria                         0                 0
      BAYSIDE                        37                 0
      BELLEROSE                       7                 0
      BREEZY POINT                    2                 0
      BRONX                        1415                 0
      BROOKLYN                     2394                 0
      CAMBRIA HEIGHTS                11                 0
      CENTRAL PARK                    0                 0
      COLLEGE POINT                  28                 0
      CORONA                         61                 0
      EAST ELMHURST                  59                 0
      ELMHURST                       38                 0
      East Elmhurst                   0                 0
      FAR ROCKAWAY                   89                 0
      FLORAL PARK                     2                 0
      FLUSHING                      143                 0
      FOREST HILLS                   45                 0
      FRESH MEADOWS                  45                 0
      GLEN OAKS                       5                 0
      HOLLIS                         33                 0
      HOWARD BEACH                   31                 0
      Howard Beach                    0                 0
      JACKSON HEIGHTS                42                 0
      JAMAICA                       229                 0
      KEW GARDENS                    19                 0
      LITTLE NECK                    15                 0
      LONG ISLAND CITY               30                 0
      Long Island City                0                 0
      MASPETH                        36                 0
      MIDDLE VILLAGE                 22                 0
      NEW HYDE PARK                   1                 0
      NEW YORK                     1525                 0
      OAKLAND GARDENS                19                 0
      OZONE PARK                     48                 0
      QUEENS                          0                 1
      QUEENS VILLAGE                 66                 0
      REGO PARK                      26                 0
      RICHMOND HILL                  32                 0
      RIDGEWOOD                     117                 0
      ROCKAWAY PARK                  30                 0
      ROSEDALE                       33                 0
      SAINT ALBANS                   30                 0
      SOUTH OZONE PARK               55                 0
```

```
SOUTH RICHMOND HILL              26                    0
SPRINGFIELD GARDENS              24                    0
STATEN ISLAND                   557                    0
SUNNYSIDE                        35                    0
WHITESTONE                       28                    0
WOODHAVEN                        45                    0
WOODSIDE                         69                    0
Woodside                          0                    0
All                            7767                    1

complaint_type       Bike/Roller/Skate Chronic  Blocked Driveway  \
city
ARVERNE                                       0                35
ASTORIA                                      15              2618
Astoria                                       0               116
BAYSIDE                                       0               377
BELLEROSE                                     1                95
BREEZY POINT                                  0                 3
BRONX                                        20             12754
BROOKLYN                                    111             28147
CAMBRIA HEIGHTS                               0               147
CENTRAL PARK                                  0                 0
COLLEGE POINT                                 0               435
CORONA                                        0              2761
EAST ELMHURST                                 1              1408
ELMHURST                                      2              1446
East Elmhurst                                 0                 0
FAR ROCKAWAY                                  0               284
FLORAL PARK                                   0                20
FLUSHING                                      3              2794
FOREST HILLS                                  5               663
FRESH MEADOWS                                 0               503
GLEN OAKS                                     0                30
HOLLIS                                        0               342
HOWARD BEACH                                  1               167
Howard Beach                                  0                 1
JACKSON HEIGHTS                               2               568
JAMAICA                                       2              2817
KEW GARDENS                                   0               313
LITTLE NECK                                   0               121
LONG ISLAND CITY                              3               772
Long Island City                              0                34
MASPETH                                       1               732
MIDDLE VILLAGE                                1               457
NEW HYDE PARK                                 0                53
NEW YORK                                    225              2070
OAKLAND GARDENS                               2               132
```

```
OZONE PARK                               1           1259
QUEENS                                   0              2
QUEENS VILLAGE                           0            585
REGO PARK                                0            611
RICHMOND HILL                            0            871
RIDGEWOOD                                3           1693
ROCKAWAY PARK                            0             70
ROSEDALE                                 2            211
SAINT ALBANS                             0            244
SOUTH OZONE PARK                         1            942
SOUTH RICHMOND HILL                      1           1548
SPRINGFIELD GARDENS                      0            262
STATEN ISLAND                            7           2142
SUNNYSIDE                                2            206
WHITESTONE                               4            208
WOODHAVEN                                2           1059
WOODSIDE                                 4           1613
Woodside                                 0             11
All                                    422          76752
```

complaint_type	Derelict Vehicle	Disorderly Youth	Drinking	Graffiti \
city				
ARVERNE	27	2	1	1
ASTORIA	351	3	35	4
Astoria	12	0	0	0
BAYSIDE	198	1	1	3
BELLEROSE	89	2	1	0
BREEZY POINT	3	0	1	0
BRONX	1952	63	188	9
BROOKLYN	5179	72	257	43
CAMBRIA HEIGHTS	115	0	0	0
CENTRAL PARK	0	0	0	0
COLLEGE POINT	184	1	0	1
CORONA	57	6	33	2
EAST ELMHURST	113	1	9	3
ELMHURST	78	2	13	0
East Elmhurst	1	0	0	0
FAR ROCKAWAY	187	1	4	0
FLORAL PARK	56	1	1	0
FLUSHING	440	2	40	4
FOREST HILLS	52	1	1	3
FRESH MEADOWS	291	0	2	0
GLEN OAKS	49	0	0	0
HOLLIS	143	1	3	0
HOWARD BEACH	138	1	4	0
Howard Beach	0	0	0	0
JACKSON HEIGHTS	29	0	9	0

JAMAICA	953	8	34	3
KEW GARDENS	14	0	1	0
LITTLE NECK	61	2	1	0
LONG ISLAND CITY	195	1	7	2
Long Island City	4	0	0	0
MASPETH	434	2	9	0
MIDDLE VILLAGE	296	0	2	0
NEW HYDE PARK	14	0	0	0
NEW YORK	537	69	295	22
OAKLAND GARDENS	86	1	1	0
OZONE PARK	420	4	19	0
QUEENS	1	0	0	0
QUEENS VILLAGE	370	0	5	1
REGO PARK	81	0	4	1
RICHMOND HILL	166	0	9	1
RIDGEWOOD	330	3	10	2
ROCKAWAY PARK	9	4	20	0
ROSEDALE	208	0	2	1
SAINT ALBANS	202	1	3	0
SOUTH OZONE PARK	358	2	13	0
SOUTH RICHMOND HILL	289	2	23	0
SPRINGFIELD GARDENS	210	0	6	0
STATEN ISLAND	1766	23	175	2
SUNNYSIDE	10	2	10	1
WHITESTONE	227	1	2	1
WOODHAVEN	308	0	3	0
WOODSIDE	247	1	15	3
Woodside	2	0	0	0
All	17542	286	1272	113

complaint_type	Homeless Encampment	Illegal Fireworks	… \
city			…
ARVERNE	4	0	…
ASTORIA	32	4	…
Astoria	0	0	…
BAYSIDE	2	0	…
BELLEROSE	1	1	…
BREEZY POINT	0	0	…
BRONX	247	24	…
BROOKLYN	857	61	…
CAMBRIA HEIGHTS	5	1	…
CENTRAL PARK	0	0	…
COLLEGE POINT	3	0	…
CORONA	19	0	…
EAST ELMHURST	2	0	…
ELMHURST	32	1	…
East Elmhurst	0	0	…

```
FAR ROCKAWAY                           14                    0   …
FLORAL PARK                             0                    0   …
FLUSHING                               26                    2   …
FOREST HILLS                           18                    1   …
FRESH MEADOWS                           5                    0   …
GLEN OAKS                               0                    0   …
HOLLIS                                  9                    0   …
HOWARD BEACH                            3                    3   …
Howard Beach                            0                    0   …
JACKSON HEIGHTS                        11                    1   …
JAMAICA                                79                    4   …
KEW GARDENS                             5                    0   …
LITTLE NECK                             0                    0   …
LONG ISLAND CITY                       10                    0   …
Long Island City                        0                    0   …
MASPETH                                10                    1   …
MIDDLE VILLAGE                          5                    0   …
NEW HYDE PARK                           0                    0   …
NEW YORK                             2775                   36   …
OAKLAND GARDENS                         1                    0   …
OZONE PARK                              6                    1   …
QUEENS                                  2                    0   …
QUEENS VILLAGE                         15                    5   …
REGO PARK                               6                    0   …
RICHMOND HILL                          28                    4   …
RIDGEWOOD                              23                    2   …
ROCKAWAY PARK                           4                    0   …
ROSEDALE                                4                    0   …
SAINT ALBANS                            8                    0   …
SOUTH OZONE PARK                        4                    1   …
SOUTH RICHMOND HILL                    11                    2   …
SPRINGFIELD GARDENS                     5                    1   …
STATEN ISLAND                          71                   10   …
SUNNYSIDE                              11                    0   …
WHITESTONE                              0                    1   …
WOODHAVEN                               9                    0   …
WOODSIDE                               33                    1   …
Woodside                                0                    0   …
All                                  4415                  168   …

complaint_type     Noise - Park  Noise - Street/Sidewalk  Noise - Vehicle  \
city
ARVERNE                       2                       29                7
ASTORIA                      61                      386              204
Astoria                       0                      114                0
BAYSIDE                       4                       15               16
BELLEROSE                     1                       13               10
```

BREEZY POINT	0	1	1
BRONX	547	8890	3396
BROOKLYN	1555	13354	5176
CAMBRIA HEIGHTS	0	25	77
CENTRAL PARK	0	95	0
COLLEGE POINT	2	33	131
CORONA	24	238	100
EAST ELMHURST	5	107	61
ELMHURST	34	224	47
East Elmhurst	0	0	0
FAR ROCKAWAY	23	136	77
FLORAL PARK	0	3	2
FLUSHING	58	225	129
FOREST HILLS	20	95	57
FRESH MEADOWS	8	42	88
GLEN OAKS	37	6	4
HOLLIS	17	41	47
HOWARD BEACH	2	21	5
Howard Beach	0	0	0
JACKSON HEIGHTS	8	217	58
JAMAICA	38	339	302
KEW GARDENS	0	10	18
LITTLE NECK	2	8	5
LONG ISLAND CITY	54	123	107
Long Island City	0	26	0
MASPETH	3	121	19
MIDDLE VILLAGE	4	37	42
NEW HYDE PARK	0	0	2
NEW YORK	1210	20426	5484
OAKLAND GARDENS	14	19	5
OZONE PARK	18	137	71
QUEENS	0	6	2
QUEENS VILLAGE	2	66	41
REGO PARK	22	57	43
RICHMOND HILL	4	87	64
RIDGEWOOD	28	433	217
ROCKAWAY PARK	2	189	27
ROSEDALE	69	24	25
SAINT ALBANS	1	79	41
SOUTH OZONE PARK	4	105	85
SOUTH RICHMOND HILL	2	91	81
SPRINGFIELD GARDENS	1	38	42
STATEN ISLAND	67	816	356
SUNNYSIDE	15	65	48
WHITESTONE	6	33	28
WOODHAVEN	3	86	74
WOODSIDE	38	250	105

Woodside	0		5	0
All	4015		47986	17027

complaint_type	Panhandling	Posting Advertisement	Squeegee	Traffic \
city				
ARVERNE	1	0	0	0
ASTORIA	1	1	0	47
Astoria	0	0	0	0
BAYSIDE	0	0	0	9
BELLEROSE	1	1	0	7
BREEZY POINT	0	0	0	0
BRONX	19	17	0	355
BROOKLYN	49	45	0	1085
CAMBRIA HEIGHTS	0	0	0	6
CENTRAL PARK	0	0	0	0
COLLEGE POINT	0	0	0	14
CORONA	1	1	0	12
EAST ELMHURST	0	1	0	20
ELMHURST	3	1	0	14
East Elmhurst	0	0	0	0
FAR ROCKAWAY	0	0	0	10
FLORAL PARK	0	0	0	0
FLUSHING	2	1	0	47
FOREST HILLS	5	3	0	60
FRESH MEADOWS	1	0	0	13
GLEN OAKS	0	0	0	3
HOLLIS	0	0	0	11
HOWARD BEACH	1	0	0	9
Howard Beach	0	0	0	0
JACKSON HEIGHTS	1	1	0	13
JAMAICA	3	7	0	560
KEW GARDENS	0	0	0	10
LITTLE NECK	0	1	0	17
LONG ISLAND CITY	2	1	0	72
Long Island City	0	0	0	0
MASPETH	0	0	0	55
MIDDLE VILLAGE	0	0	0	12
NEW HYDE PARK	0	0	0	0
NEW YORK	193	41	4	1548
OAKLAND GARDENS	0	0	0	6
OZONE PARK	7	3	0	19
QUEENS	0	0	0	2
QUEENS VILLAGE	1	1	0	26
REGO PARK	0	0	0	14
RICHMOND HILL	0	1	0	7
RIDGEWOOD	0	1	0	42
ROCKAWAY PARK	0	0	0	7

city					
ROSEDALE	0		0	0	23
SAINT ALBANS	0		0	0	11
SOUTH OZONE PARK	0		1	0	28
SOUTH RICHMOND HILL	0		0	0	11
SPRINGFIELD GARDENS	2		2	0	11
STATEN ISLAND	12		515	0	200
SUNNYSIDE	0		2	0	16
WHITESTONE	0		0	0	17
WOODHAVEN	0		0	0	6
WOODSIDE	0		0	0	39
Woodside	0		0	0	0
All	305		648	4	4494

complaint_type	Urinating in Public	Vending	All
city			
ARVERNE	1	1	220
ASTORIA	9	54	6330
Astoria	0	0	716
BAYSIDE	0	2	1221
BELLEROSE	1	0	375
BREEZY POINT	0	0	30
BRONX	51	379	40697
BROOKLYN	136	515	98295
CAMBRIA HEIGHTS	0	0	477
CENTRAL PARK	0	0	97
COLLEGE POINT	0	1	1220
CORONA	7	62	4295
EAST ELMHURST	5	9	2733
ELMHURST	10	21	2673
East Elmhurst	0	0	14
FAR ROCKAWAY	1	9	1179
FLORAL PARK	0	0	152
FLUSHING	12	33	5970
FOREST HILLS	2	10	1688
FRESH MEADOWS	1	1	1899
GLEN OAKS	2	18	306
HOLLIS	2	0	1012
HOWARD BEACH	0	5	931
Howard Beach	0	0	1
JACKSON HEIGHTS	2	78	1688
JAMAICA	33	20	7294
KEW GARDENS	3	1	771
LITTLE NECK	1	0	559
LONG ISLAND CITY	3	30	2436
Long Island City	0	0	134
MASPETH	2	6	2461
MIDDLE VILLAGE	0	0	1765

```
NEW HYDE PARK                         0        0       98
NEW YORK                            251     2398    65972
OAKLAND GARDENS                       0        2      551
OZONE PARK                            4        1     2755
QUEENS                                1        0       32
QUEENS VILLAGE                        5        2     1814
REGO PARK                             1        3     1486
RICHMOND HILL                         5       13     1902
RIDGEWOOD                             8        8     5162
ROCKAWAY PARK                         1        2      745
ROSEDALE                              0       16      922
SAINT ALBANS                          1        2      834
SOUTH OZONE PARK                      2        5     2173
SOUTH RICHMOND HILL                   0       24     2774
SPRINGFIELD GARDENS                   3        1      883
STATEN ISLAND                        14       25    12338
SUNNYSIDE                             2       15      723
WHITESTONE                            0        1     1098
WOODHAVEN                             2        6     2463
WOODSIDE                              8       15     3544
Woodside                              0        0      120
All                                 592     3794   298028

[54 rows x 23 columns]
```

[34]: `cont_table.shape`

[34]: (54, 23)

[35]: `observed_values=cont_table.values`

[36]: `observed_values`

[36]:
```
array([[   38,     0,     0, …,     1,     1,    220],
       [  125,     0,    15, …,     9,    54,   6330],
       [    0,     0,     0, …,     0,     0,    716],
       …,
       [   69,     0,     4, …,     8,    15,   3544],
       [    0,     0,     0, …,     0,     0,    120],
       [ 7767,     1,   422, …,   592,  3794, 298028]], dtype=int64)
```

[39]:
```python
#chi-square test

from scipy import stats
ch=stats.chi2_contingency(observed_values)
p_val=ch[1]
```

```
[40]: if p_val<0.05:
          print("Reject the Null Hypothesis. \nThere is a relation between complaint␣
      ↪type and location")
      else:
          print("Fail to reject the Null Hypothesis. \nThere is no relation between␣
      ↪complaint type and location")
```

```
Reject the Null Hypothesis.
There is a relation between complaint type and location
```

[ ]: