```
In [1]:  import requests # library to handle requests
         import pandas as pd # library for data analsysis
         import numpy as np # library to handle data in a vectorized manner
         from geopy.geocoders import Nominatim # module to convert an address into latitude and longitude values
         import folium # plotting library
         from sklearn.cluster import KMeans
         # Matplotlib and associated plotting modules
         import matplotlib.cm as cm
         import matplotlib.colors as colors
         # libraries for displaying images
         from IPython.display import Image
         from IPython.core.display import HTML
         # tranforming json file into a pandas dataframe library
         from pandas.io.json import json_normalize
```

```
In [2]:  # read data file
         df = pd.read_csv('mrt_lrt_data2.csv')
         df.head()
```

Out[2]:

	station_name	type	lat	lng
0	Jurong East	MRT	1.333207	103.742308
1	Bukit Batok	MRT	1.349069	103.749596
2	Bukit Gombak	MRT	1.359043	103.751863
3	Choa Chu Kang	MRT	1.385417	103.744316
4	Yew Tee	MRT	1.397383	103.747523

```
In [3]:  # Basic type information about data
         df.dtypes
```

```
Out[3]:  station_name      object
         type              object
         lat              float64
         lng              float64
         dtype: object
```

```
In [4]: #check number of LRT and MRT stations
        df_group = df.groupby('type').count()
        df_group
```

Out[4]:

	station_name	lat	lng
type			
LRT	38	38	38
MRT	119	119	119

```
In [5]: #Get MRT data into new dataframe - confine analysis to MRT stations
        df_MRT = df.loc[df['type'] == 'MRT']
        df_MRT.head()
```

Out[5]:

	station_name	type	lat	lng
0	Jurong East	MRT	1.333207	103.742308
1	Bukit Batok	MRT	1.349069	103.749596
2	Bukit Gombak	MRT	1.359043	103.751863
3	Choa Chu Kang	MRT	1.385417	103.744316
4	Yew Tee	MRT	1.397383	103.747523

```
In [6]: # check size of MRT data
        df_MRT.shape
```

Out[6]: (119, 4)

```
In [7]: # create map of MRT stations using latitude and longitude values
        latitude = 1.333207
        longitude = 103.742308
        map_stations = folium.Map(location=[latitude, longitude], zoom_start=11)
        # add markers to map
        for lat, lng, label in zip(df_MRT['lat'], df_MRT['lng'], df_MRT['station_name']):
            label = folium.Popup(label, parse_html=True)
            folium.CircleMarker(
            [lat, lng],
            radius=5,
            popup=label,
            color='blue',
            fill=True,
            fill_color='#3186cc',
            fill_opacity=0.7,
            parse_html=False).add_to(map_stations)
        map_stations
```

```
In [8]:  #Define Foursquare Credentials and Version
         CLIENT_ID = 'FDY3QVWSW23NMBO4PHY5FOJQ5UVROZ5F0ZX1E1TIUFY0AF2P' # your Foursquare ID
         CLIENT_SECRET = 'SWWAWUV1E1JRRGXIBXWOBVRDZINMQD5FCYJBULLTZ0GLPLGB' # your Foursquare Secret
         VERSION = '20180605' # Foursquare API version
         print('Your credentails:')
         print('CLIENT_ID: ' + CLIENT_ID)
         print('CLIENT_SECRET:' + CLIENT_SECRET)
```

```
Your credentails:
CLIENT_ID: FDY3QVWSW23NMBO4PHY5FOJQ5UVROZ5F0ZX1E1TIUFY0AF2P
CLIENT_SECRET:SWWAWUV1E1JRRGXIBXWOBVRDZINMQD5FCYJBULLTZ0GLPLGB
```

```
In [9]:  #first station locaton
         df_MRT.loc[0, 'station_name']
```

Out[9]: 'Jurong East'

```
In [10]:  #get latitude and longitude of Jurong East
          station_latitude = df_MRT.loc[0, 'lat'] # station latitude value
          station_longitude = df_MRT.loc[0, 'lng'] # station longitude value
          station_name = df_MRT.loc[0, 'station_name'] # station name
          print('Latitude and longitude values of {} are {}, {}.'.format(station_name, station_latitude, station_longitude))
```

```
Latitude and longitude values of Jurong East are 1.333207, 103.742308.
```

```
In [11]:  LIMIT = 100 # limit of number of venues returned by Foursquare API
          radius = 500 # define radius
          url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
              CLIENT_ID,
              CLIENT_SECRET,
              VERSION,
              station_latitude,
              station_longitude,
              radius,
              LIMIT)
          url # display URL
```

Out[11]: 'https://api.foursquare.com/v2/venues/explore?&client_id=FDY3QVWSW23NMBO4PHY5FOJQ5UVROZ5F0ZX1E1TIUFY0AF2P&client_secret=SWWAWUV1E1JRRGXIBXWOB
         VRDZINMQD5FCYJBULLTZ0GLPLGB&v=20180605&ll=1.333207,103.742308&radius=500&limit=100'

```
In [12]:   results = requests.get(url).json() #get results
           results
```

Out[12]: {'meta': {'code': 200, 'requestId': '5e7a121514a126001b596036'},
         'response': {'suggestedFilters': {'header': 'Tap to show:',
           'filters': [{'name': 'Open now', 'key': 'openNow'}]},
          'headerLocation': 'Jurong East',
          'headerFullLocation': 'Jurong East, Singapore',
          'headerLocationGranularity': 'neighborhood',
          'totalResults': 74,
          'suggestedBounds': {'ne': {'lat': 1.3377070045000046,
            'lng': 103.74680081871648},
           'sw': {'lat': 1.3287069954999955, 'lng': 103.73781518128351}},
          'groups': [{'type': 'Recommended Places',
            'name': 'recommended',
            'items': [{'reasons': {'count': 0,
                'items': [{'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason'}]},
              'venue': {'id': '51c0356c498e19c820f5e48e',
               'name': 'UNIQLO',
               'location': {'address': '#02-37 & #03-30, Jem',
                'crossStreet': '50 Jurong Gateway Rd',
                'lat': 1.333175096970959,
                'lng': 103.74316037528905,
                'labeledLatLngs': [{'label': 'display',
                  'lat': 1.333175096970959,
                  'lng': 103.74316037528905}],
                'distance': 94,
                'postalCode': '608549',
                'cc': 'SG',
                'city': 'Singapore',
                'country': 'Singapore',
                'formattedAddress': ['#02-37 & #03-30, Jem (50 Jurong Gateway Rd)',
                 '608549',
                 'Singapore']},
               'categories': [{'id': '4bf58dd8d48988d103951735',
                 'name': 'Clothing Store',
                 'pluralName': 'Clothing Stores',
                 'shortName': 'Apparel',
                 'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/apparel_',
                  'suffix': '.png'},
                 'primary': True}],
               'photos': {'count': 0, 'groups': []}},
              'referralId': 'e-0-51c0356c498e19c820f5e48e-0'},
             {'reasons': {'count': 0,
                'items': [{'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason'}]},
              'venue': {'id': '51bc1e18498e05700ad1d9a8',
               'name': 'MUJI 無印良品',
               'location': {'address': '#04-33, JEM',

      'crossStreet': '50 Jurong Gateway Rd',
      'lat': 1.3331868724770302,
      'lng': 103.74306435074546,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.3331868724770302,
        'lng': 103.74306435074546}],
      'distance': 84,
      'postalCode': '608549',
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['#04-33, JEM (50 Jurong Gateway Rd)',
       '608549',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d1f8941735',
       'name': 'Furniture / Home Store',
       'pluralName': 'Furniture / Home Stores',
       'shortName': 'Furniture / Home',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/furniture_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-51bc1e18498e05700ad1d9a8-1'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '57da318d498eb4cff0984d53',
     'name': 'Song Fa Bak Kut Teh 松發肉骨茶',
     'location': {'address': 'JEM 50 Jurong Gateway Road #B1-09(S)',
      'lat': 1.3333938719531726,
      'lng': 103.74341967353692,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.3333938719531726,
        'lng': 103.74341967353692}],
      'distance': 125,
      'postalCode': '608549',
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['JEM 50 Jurong Gateway Road #B1-09(S)',
       '608549',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d145941735',
       'name': 'Chinese Restaurant',
       'pluralName': 'Chinese Restaurants',
       'shortName': 'Chinese',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/asian_',
        'suffix': '.png'},

          'primary': True}],
        'photos': {'count': 0, 'groups': []}},
      'referralId': 'e-0-57da318d498eb4cff0984d53-2'},
    {'reasons': {'count': 0,
      'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]},
      'venue': {'id': '52a3109a11d2d5f6e87aa8da',
        'name': 'Johan Paris',
        'location': {'address': '#B2-01. Westgate',
          'crossStreet': '3 Gateway Dr.',
          'lat': 1.334083168771419,
          'lng': 103.74238405765479,
          'labeledLatLngs': [{'label': 'display',
            'lat': 1.334083168771419,
            'lng': 103.74238405765479}],
          'distance': 97,
          'postalCode': '608532',
          'cc': 'SG',
          'city': 'Singapore',
          'country': 'Singapore',
          'formattedAddress': ['#B2-01. Westgate (3 Gateway Dr.)',
            '608532',
            'Singapore']},
        'categories': [{'id': '4bf58dd8d48988d16a941735',
          'name': 'Bakery',
          'pluralName': 'Bakeries',
          'shortName': 'Bakery',
          'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/bakery_',
            'suffix': '.png'},
          'primary': True}],
        'photos': {'count': 0, 'groups': []}},
      'referralId': 'e-0-52a3109a11d2d5f6e87aa8da-3'},
    {'reasons': {'count': 0,
      'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]},
      'venue': {'id': '4f71a5354fc60caa7ecd5335',
        'name': 'The Rink',
        'location': {'address': '#03-11, JCube',
          'crossStreet': '2 Jurong East Central 1',
          'lat': 1.3334240944657456,
          'lng': 103.74034536911829,
          'labeledLatLngs': [{'label': 'display',
            'lat': 1.3334240944657456,
            'lng': 103.74034536911829}],
          'distance': 219,
          'postalCode': '609731',
          'cc': 'SG',

      'city': 'Singapore',
      'country': 'Singapore',
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       '609731',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d168941735',
       'name': 'Skating Rink',
       'pluralName': 'Skating Rinks',
       'shortName': 'Skating Rink',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/skatingrink_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4f71a5354fc60caa7ecd5335-4'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '529d7369498ee53de1b211f9',
     'name': 'Platinum Movie Suites',
     'location': {'address': 'Cathay Cineplex Jem, Lv 5, Jem',
      'crossStreet': '50 Jurong Gateway Rd.',
      'lat': 1.3334250947997497,
      'lng': 103.7441133014962,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.3334250947997497,
        'lng': 103.7441133014962}],
      'distance': 202,
      'postalCode': '608549',
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['Cathay Cineplex Jem, Lv 5, Jem (50 Jurong Gateway Rd.)',
       '608549',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d17f941735',
       'name': 'Movie Theater',
       'pluralName': 'Movie Theaters',
       'shortName': 'Movie Theater',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/movietheater_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-529d7369498ee53de1b211f9-5'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '51b4daf27dd2cecfa1f26d78',

     'name': 'Books Kinokuniya',
     'location': {'address': '#04-23, Jem',
      'crossStreet': '50 Jurong Gateway Rd',
      'lat': 1.3334816668155773,
      'lng': 103.74316317743188,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.3334816668155773,
        'lng': 103.74316317743188}],
      'distance': 99,
      'postalCode': '608549',
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['#04-23, Jem (50 Jurong Gateway Rd)',
       '608549',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d114951735',
       'name': 'Bookstore',
       'pluralName': 'Bookstores',
       'shortName': 'Bookstore',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/bookstore_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-51b4daf27dd2cecfa1f26d78-6'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '529d6d7011d2f5ed71bca0f2',
     'name': 'Tonkatsu by Ma Maison とんかつ マメゾン (Tonkatsu by Ma Maison)',
     'location': {'address': '#04-06, Westgate',
      'crossStreet': '3 Gateway Dr.',
      'lat': 1.3336684475675613,
      'lng': 103.74281781453568,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.3336684475675613,
        'lng': 103.74281781453568}],
      'distance': 76,
      'postalCode': '608532',
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['#04-06, Westgate (3 Gateway Dr.)',
       '608532',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d111941735',
       'name': 'Japanese Restaurant',
       'pluralName': 'Japanese Restaurants',

      'shortName': 'Japanese',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/japanese_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-529d6d7011d2f5ed71bca0f2-7'},
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    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '50fce0b58302b64ee3172961',
    'name': 'Cathay Cineplexes',
    'location': {'address': '#05-04, Jem',
     'crossStreet': '50 Jurong Gateway Rd',
     'lat': 1.3333892927617659,
     'lng': 103.74357229807055,
     'labeledLatLngs': [{'label': 'display',
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       'lng': 103.74357229807055}],
     'distance': 142,
     'postalCode': '608549',
     'cc': 'SG',
     'city': 'Singapore',
     'country': 'Singapore',
     'formattedAddress': ['#05-04, Jem (50 Jurong Gateway Rd)',
      '608549',
      'Singapore']},
    'categories': [{'id': '4bf58dd8d48988d180941735',
      'name': 'Multiplex',
      'pluralName': 'Multiplexes',
      'shortName': 'Cineplex',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/movietheater_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-50fce0b58302b64ee3172961-8'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '5483e0d3498eced49ccf7585',
    'name': 'Dian Xiao Er 店小二 (Dian Xiao Er)',
    'location': {'address': '#03-08 JEM',
     'crossStreet': '50 Jurong Gateway Road',
     'lat': 1.333446950468997,
     'lng': 103.74309389919995,
     'labeledLatLngs': [{'label': 'display',
       'lat': 1.333446950468997,
       'lng': 103.74309389919995}],

         'distance': 91,
         'postalCode': '608549',
         'cc': 'SG',
         'city': 'Singapore',
         'country': 'Singapore',
         'formattedAddress': ['#03-08 JEM (50 Jurong Gateway Road)',
          '608549',
          'Singapore']},
        'categories': [{'id': '4bf58dd8d48988d145941735',
          'name': 'Chinese Restaurant',
          'pluralName': 'Chinese Restaurants',
          'shortName': 'Chinese',
          'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/asian_',
           'suffix': '.png'},
          'primary': True}],
        'photos': {'count': 0, 'groups': []}},
       'referralId': 'e-0-5483e0d3498eced49ccf7585-9'},
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        'items': [{'summary': 'This spot is popular',
          'type': 'general',
          'reasonName': 'globalInteractionReason'}]},
       'venue': {'id': '553a0e54498e07ead0f7da85',
        'name': 'Green Dot',
        'location': {'address': '#01-08, Westgate',
         'crossStreet': '3 Gateway Drive',
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         'lng': 103.74285825778365,
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         'postalCode': '608532',
         'cc': 'SG',
         'city': 'Singapore',
         'country': 'Singapore',
         'formattedAddress': ['#01-08, Westgate (3 Gateway Drive)',
          '608532',
          'Singapore']},
        'categories': [{'id': '4bf58dd8d48988d1d3941735',
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          'pluralName': 'Vegetarian / Vegan Restaurants',
          'shortName': 'Vegetarian / Vegan',
          'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/vegetarian_',
           'suffix': '.png'},
          'primary': True}],
        'photos': {'count': 0, 'groups': []}},
       'referralId': 'e-0-553a0e54498e07ead0f7da85-10'},
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         'type': 'general',
         'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '53c21b64498e8086c89b022f',
    'name': 'TOKYU HANDS',
    'location': {'address': '#01-36/37 Westgate',
     'crossStreet': '3 Gateway Dr.',
     'lat': 1.3343412171318205,
     'lng': 103.74325862645334,
     'labeledLatLngs': [{'label': 'display',
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       'lng': 103.74325862645334}],
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     'cc': 'SG',
     'city': 'Singapore',
     'country': 'Singapore',
     'formattedAddress': ['#01-36/37 Westgate (3 Gateway Dr.)',
      '608532',
      'Singapore']},
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      'name': 'Department Store',
      'pluralName': 'Department Stores',
      'shortName': 'Department Store',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/departmentstore_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-53c21b64498e8086c89b022f-11'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '51bc0381498e60a6b0e308c8',
    'name': 'Pepper Lunch',
    'location': {'address': '#04-10/11/12, Jem',
     'crossStreet': '50 Jurong Gateway Rd',
     'lat': 1.3333617653895071,
     'lng': 103.74308602950269,
     'labeledLatLngs': [{'label': 'display',
       'lat': 1.3333617653895071,
       'lng': 103.74308602950269}],
     'distance': 88,
     'postalCode': '608549',
     'cc': 'SG',
     'city': 'Singapore',
     'country': 'Singapore',
     'formattedAddress': ['#04-10/11/12, Jem (50 Jurong Gateway Rd)',
      '608549',
      'Singapore']},

    'categories': [{'id': '4bf58dd8d48988d111941735',
      'name': 'Japanese Restaurant',
      'pluralName': 'Japanese Restaurants',
      'shortName': 'Japanese',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/japanese_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-51bc0381498e60a6b0e308c8-12'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '51fb65b2498eda7c97d7408c',
    'name': 'Westgate',
    'location': {'address': '3 Gateway Dr',
     'crossStreet': 'Jurong Gateway Rd',
     'lat': 1.3342247401660687,
     'lng': 103.74282360076903,
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  'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]},
 'venue': {'id': '4c9fecae2fb1a1437d61f840',
  'name': 'Fu Chan Food Paradise',
  'location': {'address': '134 Jurong Gateway Rd. #01-309.',
   'crossStreet': 'Jurong East',
   'lat': 1.33448902600706,
   'lng': 103.73874339410766,
   'labeledLatLngs': [{'label': 'display',
     'lat': 1.33448902600706,
     'lng': 103.73874339410766}],
   'distance': 421,
   'postalCode': '600134',
   'cc': 'SG',
   'city': 'Singapore',
   'country': 'Singapore',
   'formattedAddress': ['134 Jurong Gateway Rd. #01-309. (Jurong East)',
    '600134',
    'Singapore']},
  'categories': [{'id': '4bf58dd8d48988d120951735',
    'name': 'Food Court',
    'pluralName': 'Food Courts',
    'shortName': 'Food Court',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/food_foodcourt_',
     'suffix': '.png'},
    'primary': True}],
  'photos': {'count': 0, 'groups': []}},
 'referralId': 'e-0-4c9fecae2fb1a1437d61f840-68'},
{'reasons': {'count': 0,
  'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]},
 'venue': {'id': '56da2c4d498e26499ed4f6d5',
  'name': 'Festive Cafe',
  'location': {'address': 'Genting Hotel Jurong',
   'lat': 1.3315395,
   'lng': 103.73933,
   'labeledLatLngs': [{'label': 'display',
     'lat': 1.3315395,
     'lng': 103.73933}],
   'distance': 379,
   'cc': 'SG',
   'city': 'Jurong West New Town',
   'country': 'Singapore',
   'formattedAddress': ['Genting Hotel Jurong', 'Singapore']},

    'categories': [{'id': '52e81612bcbc57f1066b79f4',
      'name': 'Buffet',
      'pluralName': 'Buffets',
      'shortName': 'Buffet',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-56da2c4d498e26499ed4f6d5-69'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '4b53dadef964a5204cad27e3',
    'name': 'BGAIN130 Eating House',
    'location': {'address': '130 Jurong Gateway Road',
     'lat': 1.3353371503640463,
     'lng': 103.73927991996325,
     'labeledLatLngs': [{'label': 'display',
       'lat': 1.3353371503640463,
       'lng': 103.73927991996325}],
     'distance': 412,
     'postalCode': '600130',
     'cc': 'SG',
     'city': 'Singapore',
     'country': 'Singapore',
     'formattedAddress': ['130 Jurong Gateway Road',
      '600130',
      'Singapore']},
    'categories': [{'id': '4bf58dd8d48988d120951735',
      'name': 'Food Court',
      'pluralName': 'Food Courts',
      'shortName': 'Food Court',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/food_foodcourt_',
       'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
   'referralId': 'e-0-4b53dadef964a5204cad27e3-70'},
  {'reasons': {'count': 0,
    'items': [{'summary': 'This spot is popular',
      'type': 'general',
      'reasonName': 'globalInteractionReason'}]},
   'venue': {'id': '4bfa0354b182c9b64fdd795a',
    'name': 'Waroeng Penyet Corner',
    'location': {'address': 'Fu Chan Foodcourt',
     'crossStreet': '134 Jurong East Street 13',
     'lat': 1.3345327021940716,
     'lng': 103.73888524952638,
     'labeledLatLngs': [{'label': 'display',

        'lat': 1.3345327021940716,
        'lng': 103.73888524952638}],
      'distance': 408,
      'cc': 'SG',
      'city': 'Singapore',
      'country': 'Singapore',
      'formattedAddress': ['Fu Chan Foodcourt (134 Jurong East Street 13)',
       'Singapore']},
     'categories': [{'id': '4bf58dd8d48988d142941735',
       'name': 'Asian Restaurant',
       'pluralName': 'Asian Restaurants',
       'shortName': 'Asian',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/asian_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4bfa0354b182c9b64fdd795a-71'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},
    'venue': {'id': '5a0a81e88b98fd1643667c63',
     'name': 'Milly's @ Jem',
     'location': {'address': 'Jurong East',
      'lat': 1.331492,
      'lng': 103.738403,
      'labeledLatLngs': [{'label': 'display',
        'lat': 1.331492,
        'lng': 103.738403}],
      'distance': 474,
      'postalCode': '608549',
      'cc': 'SG',
      'city': 'Jurong Town',
      'state': 'South West Community Development Council',
      'country': 'Singapore',
      'formattedAddress': ['Jurong East', '608549', 'Singapore']},
     'categories': [{'id': '54541900498ea6ccd0202697',
       'name': 'Health & Beauty Service',
       'pluralName': 'Health & Beauty Services',
       'shortName': 'Health & Beauty',
       'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/salon_barber_',
        'suffix': '.png'},
       'primary': True}],
     'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-5a0a81e88b98fd1643667c63-72'},
   {'reasons': {'count': 0,
     'items': [{'summary': 'This spot is popular',
       'type': 'general',
       'reasonName': 'globalInteractionReason'}]},

```
           'venue': {'id': '4b9aea77f964a520c9e235e3',
            'name': 'Astons Express',
            'location': {'address': '#01-309, Jurong Cafe',
             'crossStreet': '134 Jurong East St 13',
             'lat': 1.3345780939193328,
             'lng': 103.7387638514646,
             'labeledLatLngs': [{'label': 'display',
               'lat': 1.3345780939193328,
               'lng': 103.7387638514646}],
             'distance': 422,
             'postalCode': '600134',
             'cc': 'SG',
             'city': 'Singapore',
             'country': 'Singapore',
             'formattedAddress': ['#01-309, Jurong Cafe (134 Jurong East St 13)',
              '600134',
              'Singapore']},
            'categories': [{'id': '4bf58dd8d48988d1cc941735',
              'name': 'Steakhouse',
              'pluralName': 'Steakhouses',
              'shortName': 'Steakhouse',
              'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/steakhouse_',
               'suffix': '.png'},
              'primary': True}],
            'photos': {'count': 0, 'groups': []}},
           'referralId': 'e-0-4b9aea77f964a520c9e235e3-73'}]}]}}
```

In [13]:
```python
#define get_category_type function
def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']
    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']
```

In [14]:
```python
venues = results['response']['groups'][0]['items']
nearby_venues = json_normalize(venues)
```

```
In [15]: # filter columns
         filtered_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.location.lng']
         nearby_venues =nearby_venues.loc[:, filtered_columns]
         # filter the category for each row
         nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)
         # clean columns
         nearby_venues.columns = [col.split(".")[-1] for col in nearby_venues.columns]
         nearby_venues.head()
```

Out[15]:

	name	categories	lat	lng
0	UNIQLO	Clothing Store	1.333175	103.743160
1	MUJI 無印良品	Furniture / Home Store	1.333187	103.743064
2	Song Fa Bak Kut Teh 松發肉骨茶	Chinese Restaurant	1.333394	103.743420
3	Johan Paris	Bakery	1.334083	103.742384
4	The Rink	Skating Rink	1.333424	103.740345

```
In [16]: #Map for regions
         venues_map = folium.Map(location=[station_latitude, station_longitude], zoom_start=20)
         # add a red circle marker to represent the Jurong East station
         folium.features.CircleMarker(
             [station_latitude, station_longitude],
             radius=10,
             color='red',
             popup='Jurong East',
             fill = True,
             fill_color = 'red',
             fill_opacity = 0.6
         ).add_to(venues_map)
         # add all venues as blue circle markers
         for lat, lng, label in zip(nearby_venues.lat, nearby_venues.lng, nearby_venues.categories):
             folium.features.CircleMarker(
                 [lat, lng],
                 radius=5,
                 color='blue',
                 popup=label,
                 fill = True,
                 fill_color='blue',
                 fill_opacity=0.6
             ).add_to(venues_map)

         venues_map
```

Out[16]:
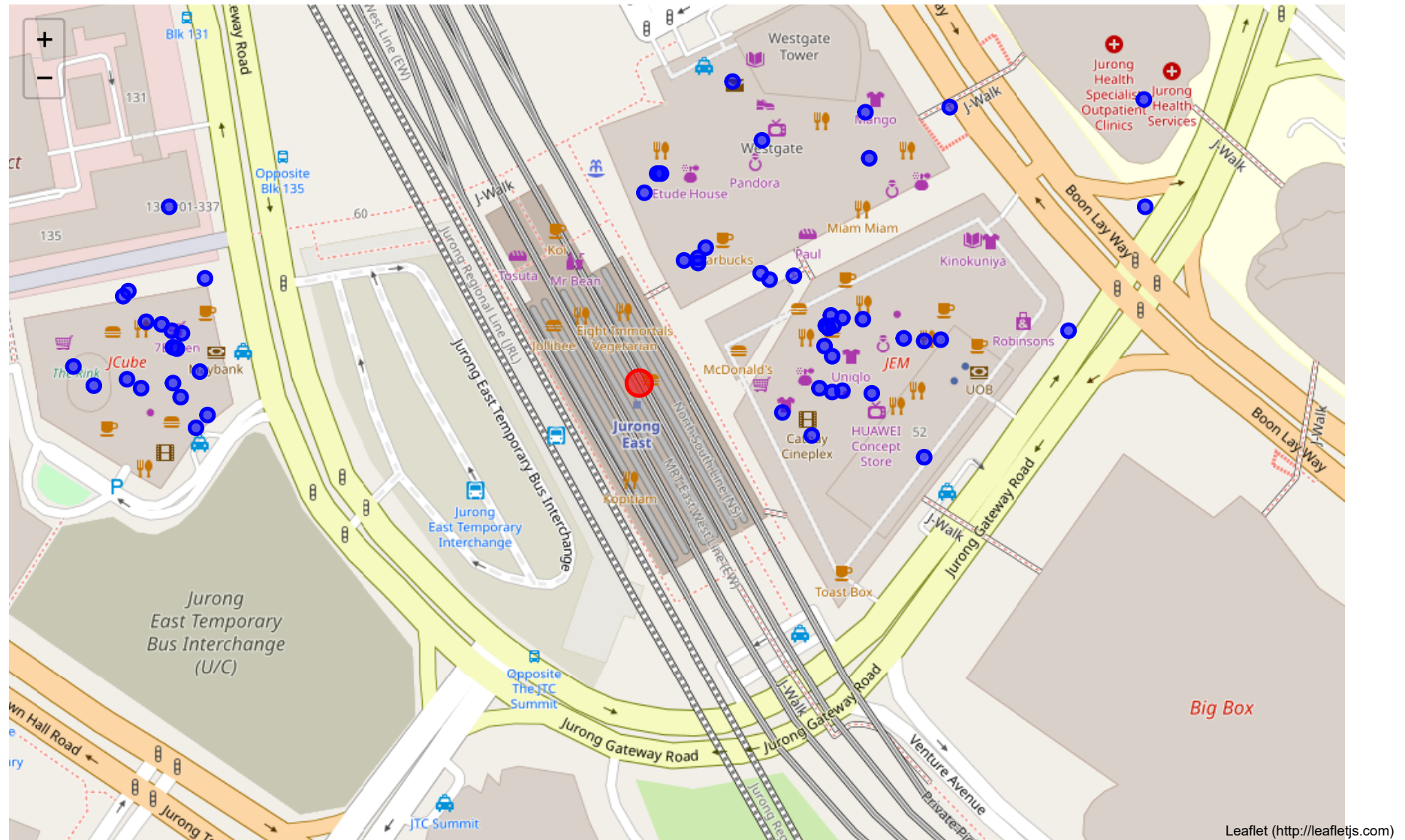
In [17]: `print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))` *# number of venues returned*

74 venues were returned by Foursquare.

```
In [18]:  #create function to repeat same process
          def getNearbyVenues(names, latitudes, longitudes, radius=500, LIMIT = 100):
              venues_list=[]
              for name, lat, lng in zip(names, latitudes, longitudes):
                  print(name)
                  # create the API request URL
                  url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
                      CLIENT_ID,
                      CLIENT_SECRET,
                      VERSION,
                      lat,
                      lng,
                      radius,
                      LIMIT)
                  # make the GET request
                  results = requests.get(url).json()["response"]['groups'][0]['items']
                  # return only relevant information for each nearby venue
                  venues_list.append([(
                      name,
                      lat,
                      lng,
                      v['venue']['name'],
                      v['venue']['location']['lat'],
                      v['venue']['location']['lng'],
                      v['venue']['categories'][0]['name']) for v in results])
              nearby_venues = pd.DataFrame([item for venue_list in venues_list for item in venue_list])
              nearby_venues.columns = ['Station',
                            'Station_Latitude',
                            'Station_Longitude',
                            'Venue',
                            'Venue_Latitude',
                            'Venue_Longitude',
                            'Venue_Category']

              return(nearby_venues)
```

```
In [19]: station_venues = getNearbyVenues(names=df_MRT['station_name'],
                                          latitudes=df_MRT['lat'],
                                          longitudes=df_MRT['lng'])
```

Jurong East
Bukit Batok
Bukit Gombak
Choa Chu Kang
Yew Tee
Kranji
Marsiling
Woodlands
Admiralty
Sembawang
Yishun
Khatib
Yio Chu Kang
Ang Mo Kio
Bishan
Braddell
Toa Payoh
Novena
Newton
Orchard
Somerset
Dhoby Ghaut
City Hall
Raffles Place
Marina Bay
Marina South Pier
Tuas Link
Tuas West Road
Tuas Crescent
Gul Circle
Joo Koon
Pioneer
Boon Lay
Lakeside
Chinese Garden
Clementi
Dover
Buona Vista
Commonwealth
Queenstown
Redhill
Tiong Bahru
Outram Park
Tanjong Pagar
Bugis
Lavender
Kallang
Aljunied
Paya Lebar

Eunos
Kembangan
Bedok
Tanah Merah
Simei
Tampines
Pasir Ris
Expo
Changi Airport
HarbourFront
Chinatown
Clarke Quay
Little India
Farrer Park
Boon Keng
Potong Pasir
Woodleigh
Serangoon
Kovan
Hougang
Buangkok
Sengkang
Punggol
Bras Basah
Esplanade
Promenade
Nicoll Highway
Stadium
Mountbatten
Dakota
MacPherson
Tai Seng
Bartley
Lorong Chuan
Marymount
Caldecott
Botanic Gardens
Farrer Road
Holland Village
one-north
Kent Ridge
Haw Par Villa
Pasir Panjang
Labrador Park
Telok Blangah
Bayfront
Bukit Panjang
Cashew
Hillview

Beauty World
King Albert Park
Sixth Avenue
Tan Kah Kee
Stevens
Rochor
Downtown
Telok Ayer
Fort Canning
Bencoolen
Jalan Besar
Bendemeer
Geylang Bahru
Mattar
Ubi
Kaki Bukit
Bedok North
Bedok Reservoir
Tampines West
Tampines East
Upper Changi

```
In [20]:   #check size of station_venues
           print(station_venues.shape)
           station_venues.sample(10)

           (4689, 7)
```

Out[20]:

	Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
3281	Stadium	1.302847	103.875417	Marble Slab Creamery	1.302638	103.873533	Ice Cream Shop
396	Bishan	1.350920	103.848206	The Coffee Bean & Tea Leaf	1.350424	103.848280	Café
1777	Lavender	1.307577	103.863155	新治發食室	1.305616	103.863214	Coffee Shop
2810	Kovan	1.360207	103.885163	天外天潮洲鱼头炉 Tian Wai Tian Fish Head Steamboat	1.358404	103.884422	Asian Restaurant
2458	Chinatown	1.284566	103.843626	Burnt Ends	1.280502	103.841745	Australian Restaurant
4573	Geylang Bahru	1.321479	103.871457	Kallang Basin Swimming Complex	1.322641	103.872213	Pool
1471	Outram Park	1.280319	103.839459	The Populus Coffee & Food Co.	1.278215	103.840715	Café
1911	Paya Lebar	1.318214	103.893133	Swissbake	1.318631	103.892926	Bakery
2379	HarbourFront	1.265453	103.820514	Saigon Xpress	1.263764	103.821125	Vietnamese Restaurant
3723	Bayfront	1.281371	103.858998	Tower 1 Marina Bay Sands Hotel	1.282213	103.859881	Hotel

```
In [21]:   #find unique categories number
           print('There are {} unique venue categories.'.format(len(station_venues['Venue_Category'].unique())))

           There are 320 unique venue categories.
```

```
In [22]:   #find unique venue number
           print('There are {} uniques venues.'.format(len(station_venues['Venue'].unique())))#number of unique venues

           There are 3202 uniques venues.
```

```
In [23]: station_venues.groupby('Station').count()
```

Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
Admiralty	9	9	9	9	9	9
Aljunied	50	50	50	50	50	50
Ang Mo Kio	40	40	40	40	40	40
Bartley	5	5	5	5	5	5
Bayfront	50	50	50	50	50	50
Beauty World	77	77	77	77	77	77
Bedok	55	55	55	55	55	55
Bedok North	22	22	22	22	22	22
Bedok Reservoir	7	7	7	7	7	7
Bencoolen	100	100	100	100	100	100
Bendemeer	21	21	21	21	21	21
Bishan	42	42	42	42	42	42
Boon Keng	22	22	22	22	22	22
Boon Lay	66	66	66	66	66	66
Botanic Gardens	35	35	35	35	35	35
Braddell	40	40	40	40	40	40
Bras Basah	100	100	100	100	100	100
Buangkok	7	7	7	7	7	7
Bugis	100	100	100	100	100	100
Bukit Batok	23	23	23	23	23	23
Bukit Gombak	21	21	21	21	21	21
Bukit Panjang	44	44	44	44	44	44
Buona Vista	74	74	74	74	74	74
Caldecott	12	12	12	12	12	12
Cashew	9	9	9	9	9	9
Changi Airport	47	47	47	47	47	47

Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
Chinatown	100	100	100	100	100	100
Chinese Garden	11	11	11	11	11	11
Choa Chu Kang	21	21	21	21	21	21
City Hall	95	95	95	95	95	95
...	...	...	...	...	...	...
Rochor	45	45	45	45	45	45
Sembawang	14	14	14	14	14	14
Sengkang	35	35	35	35	35	35
Serangoon	41	41	41	41	41	41
Simei	20	20	20	20	20	20
Sixth Avenue	36	36	36	36	36	36
Somerset	96	96	96	96	96	96
Stadium	46	46	46	46	46	46
Stevens	10	10	10	10	10	10
Tai Seng	42	42	42	42	42	42
Tampines	84	84	84	84	84	84
Tampines East	8	8	8	8	8	8
Tampines West	22	22	22	22	22	22
Tan Kah Kee	15	15	15	15	15	15
Tanah Merah	21	21	21	21	21	21
Tanjong Pagar	100	100	100	100	100	100
Telok Ayer	100	100	100	100	100	100
Telok Blangah	21	21	21	21	21	21
Tiong Bahru	29	29	29	29	29	29
Toa Payoh	27	27	27	27	27	27
Tuas Crescent	5	5	5	5	5	5
Tuas Link	7	7	7	7	7	7

Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
Ubi	12	12	12	12	12	12
Upper Changi	11	11	11	11	11	11
Woodlands	50	50	50	50	50	50
Woodleigh	10	10	10	10	10	10
Yew Tee	9	9	9	9	9	9
Yio Chu Kang	17	17	17	17	17	17
Yishun	50	50	50	50	50	50
one-north	40	40	40	40	40	40

118 rows × 6 columns

In [24]:
```python
# one hot encoding
station_onehot = pd.get_dummies(station_venues[['Venue_Category']], prefix="", prefix_sep="")
# add station column back to dataframe
station_onehot['Station'] = station_venues['Station']
# move station column to the first column
fixed_columns = [station_onehot.columns[-1]] + list(station_onehot.columns[:-1])
station_onehot = station_onehot[fixed_columns]
station_onehot.head()
```

Out[24]:

	Station	ATM	Accessories Store	Airport	Airport Lounge	American Restaurant	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	...	Water Park	Waterfall	Waterfront	Whisky Bar	Wine Bar	Wine Shop	Wings Joint	Wome St
0	Jurong East	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0
1	Jurong East	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0
2	Jurong East	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0
3	Jurong East	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0
4	Jurong East	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0

5 rows × 321 columns

In [25]:
```python
#size of new one-hot dataframe
station_onehot.shape
```

Out[25]: (4689, 321)

```
In [26]: #group rows by station and by taking the mean of the frequency of occurrence of each category
station_grouped = station_onehot.groupby('Station').mean().reset_index()
station_grouped
```

	Station	ATM	Accessories Store	Airport	Airport Lounge	American Restaurant	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	...	Water Park	Waterfall	Waterfront	Whisky Bar	Wi B
0	Admiralty	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
1	Aljunied	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
2	Ang Mo Kio	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
3	Bartley	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
4	Bayfront	0.0	0.020000	0.000000	0.000000	0.000000	0.000000	0.020000	0.00	0.000000	...	0.000000	0.000000	0.040000	0.000000	0.0000
5	Beauty World	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
6	Bedok	0.0	0.000000	0.000000	0.000000	0.018182	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
7	Bedok North	0.0	0.000000	0.000000	0.000000	0.000000	0.045455	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
8	Bedok Reservoir	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
9	Bencoolen	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.030000	0.02	0.010000	...	0.000000	0.000000	0.000000	0.020000	0.0000
10	Bendemeer	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
11	Bishan	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
12	Boon Keng	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
13	Boon Lay	0.0	0.000000	0.000000	0.000000	0.015152	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
14	Botanic Gardens	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
15	Braddell	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
16	Bras Basah	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.020000	0.00	0.010000	...	0.000000	0.000000	0.000000	0.020000	0.0000
17	Buangkok	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
18	Bugis	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.030000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0100
19	Bukit Batok	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
20	Bukit Gombak	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
21	Bukit Panjang	0.0	0.000000	0.000000	0.000000	0.045455	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000

	Station	ATM	Accessories Store	Airport	Airport Lounge	American Restaurant	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	...	Water Park	Waterfall	Waterfront	Whisky Bar	Wi B
22	Buona Vista	0.0	0.000000	0.000000	0.000000	0.013514	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0135
23	Caldecott	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
24	Cashew	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
25	Changi Airport	0.0	0.021277	0.042553	0.106383	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.021277	0.000000	0.000000	0.0000
26	Chinatown	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0200
27	Chinese Garden	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
28	Choa Chu Kang	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
29	City Hall	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.021053	0.00	0.010526	...	0.000000	0.000000	0.000000	0.010526	0.0000
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
88	Rochor	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.044444	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
89	Sembawang	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
90	Sengkang	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
91	Serangoon	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
92	Simei	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
93	Sixth Avenue	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0555
94	Somerset	0.0	0.000000	0.000000	0.000000	0.010417	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0208
95	Stadium	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.021739	0.000000	0.021739	0.000000	0.0000
96	Stevens	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
97	Tai Seng	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
98	Tampines	0.0	0.000000	0.000000	0.000000	0.011905	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
99	Tampines East	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000
100	Tampines West	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.0000

	Station	ATM	Accessories Store	Airport	Airport Lounge	American Restaurant	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	...	Water Park	Waterfall	Waterfront	Whisky Bar	Wine Bar
101	Tan Kah Kee	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
102	Tanah Merah	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
103	Tanjong Pagar	0.0	0.000000	0.000000	0.000000	0.010000	0.000000	0.010000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.01000
104	Telok Ayer	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.04000
105	Telok Blangah	0.0	0.000000	0.000000	0.000000	0.000000	0.047619	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
106	Tiong Bahru	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
107	Toa Payoh	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
108	Tuas Crescent	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
109	Tuas Link	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
110	Ubi	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
111	Upper Changi	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
112	Woodlands	0.0	0.000000	0.000000	0.000000	0.020000	0.020000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
113	Woodleigh	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
114	Yew Tee	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
115	Yio Chu Kang	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
116	Yishun	0.0	0.000000	0.000000	0.000000	0.000000	0.020000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000
117	one-north	0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	...	0.000000	0.000000	0.000000	0.000000	0.00000

118 rows × 321 columns

```python
In [27]:  #get size
          station_grouped.shape
```

Out[27]: (118, 321)

```
In [28]: #print each station along with the top 5 most common venues
         num_top_venues = 5
         for stn in station_grouped['Station']:
             print("----"+stn+"----")
             temp = station_grouped[station_grouped['Station'] == stn].T.reset_index()
             temp.columns = ['venue','freq']
             temp = temp.iloc[1:]
             temp['freq'] = temp['freq'].astype(float)
             temp = temp.round({'freq': 2})
             print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
             print('\n')
```

```
----Admiralty----
          venue  freq
0  Supermarket  0.22
1   Food Court  0.11
2         Park  0.11
3  Bus Station  0.11
4   Food Truck  0.11


----Aljunied----
                           venue  freq
0              Chinese Restaurant  0.16
1                    Noodle House  0.12
2                Asian Restaurant  0.08
3  Vegetarian / Vegan Restaurant  0.06
4              Dim Sum Restaurant  0.04


----Ang Mo Kio----
             venue  freq
0      Coffee Shop  0.12
1       Food Court  0.08
2     Dessert Shop  0.08
3      Supermarket  0.05
4  Bubble Tea Shop  0.05


----Bartley----
             venue  freq
0     Noodle House   0.4
1             Café   0.2
2    Metro Station   0.2
3             Pool   0.2
4  Other Nightlife   0.0


----Bayfront----
         venue  freq
0        Hotel  0.08
1     Boutique  0.06
2   Waterfront  0.04
3      Theater  0.04
4     Tea Room  0.04


----Beauty World----
                  venue  freq
0  Chinese Restaurant  0.10
1                Café  0.09
```

```
2     Korean Restaurant  0.09
3          Food Court  0.05
4        Shopping Mall  0.04


----Bedok----
              venue  freq
0        Coffee Shop  0.07
1         Food Court  0.05
2    Sushi Restaurant  0.05
3      Sandwich Place  0.05
4  Japanese Restaurant  0.05


----Bedok North----
          venue  freq
0      Bus Line  0.09
1          Café  0.09
2   Bus Station  0.09
3    Food Court  0.09
4         Plaza  0.05


----Bedok Reservoir----
             venue  freq
0     Noodle House  0.14
1         Bus Stop  0.14
2             Park  0.14
3  Asian Restaurant  0.14
4       Food Court  0.14


----Bencoolen----
               venue  freq
0               Café  0.09
1              Hotel  0.07
2  Japanese Restaurant  0.06
3        Art Gallery  0.03
4         Restaurant  0.03


----Bendemeer----
                        venue  freq
0                      Hostel  0.19
1                   BBQ Joint  0.14
2                  Restaurant  0.10
3  Vegetarian / Vegan Restaurant  0.10
4        Vietnamese Restaurant  0.05
```

```
----Bishan----
              venue  freq
0       Food Court  0.12
1      Coffee Shop  0.10
2             Café  0.07
3      Supermarket  0.05
4   Ice Cream Shop  0.05


----Boon Keng----
                   venue  freq
0     Chinese Restaurant  0.18
1           Noodle House  0.14
2            Coffee Shop  0.09
3   Fast Food Restaurant  0.09
4             Food Court  0.05


----Boon Lay----
                   venue  freq
0        Asian Restaurant  0.11
1     Japanese Restaurant  0.09
2    Fast Food Restaurant  0.08
3      Chinese Restaurant  0.06
4            Dessert Shop  0.06


----Botanic Gardens----
               venue  freq
0               Café  0.09
1             Bakery  0.06
2      Shopping Mall  0.06
3   Asian Restaurant  0.06
4       Noodle House  0.06


----Braddell----
                 venue  freq
0        Noodle House  0.15
1   Chinese Restaurant  0.10
2           Food Court  0.10
3                 Café  0.08
4               Bakery  0.08


----Bras Basah----
              venue  freq
0             Hotel  0.11
```

```
1                 Café  0.07
2   Japanese Restaurant  0.06
3           Coffee Shop  0.04
4              Beer Bar  0.03


----Buangkok----
                   venue  freq
0               Pharmacy  0.14
1          Metro Station  0.14
2            Wings Joint  0.14
3    Fast Food Restaurant  0.14
4                  Trail  0.14


----Bugis----
                   venue  freq
0    Japanese Restaurant  0.05
1                   Café  0.05
2                 Bakery  0.05
3     Chinese Restaurant  0.04
4                  Hotel  0.04


----Bukit Batok----
                   venue  freq
0            Coffee Shop  0.17
1     Chinese Restaurant  0.13
2   Fast Food Restaurant  0.09
3             Food Court  0.09
4       Department Store  0.04


----Bukit Gombak----
                   venue  freq
0             Food Court  0.14
1                Stadium  0.10
2      Convenience Store  0.10
3              Juice Bar  0.05
4         Ice Cream Shop  0.05


----Bukit Panjang----
                   venue  freq
0                   Café  0.09
1   Fast Food Restaurant  0.09
2       Sushi Restaurant  0.07
3       Asian Restaurant  0.07
4            Coffee Shop  0.07
```

```
----Buona Vista----
                venue  freq
0    Chinese Restaurant  0.08
1           Food Court  0.07
2   Japanese Restaurant  0.07
3      Indian Restaurant  0.05
4                Bakery  0.04


----Caldecott----
              venue  freq
0      Flower Shop  0.50
1    Metro Station  0.17
2             Café  0.08
3           Office  0.08
4   Ice Cream Shop  0.08


----Cashew----
                venue  freq
0        Bus Station  0.33
1         Food Court  0.22
2               Park  0.11
3    Basketball Court  0.11
4   Seafood Restaurant  0.11


----Changi Airport----
                 venue  freq
0       Airport Lounge  0.11
1             Boutique  0.06
2               Garden  0.06
3          Coffee Shop  0.04
4   Fast Food Restaurant  0.04


----Chinatown----
                venue  freq
0    Chinese Restaurant  0.08
1           Food Court  0.06
2               Hostel  0.06
3   Japanese Restaurant  0.04
4                Hotel  0.04


----Chinese Garden----
                     venue   freq
```

```
0                               Coffee Shop  0.18
1                        Chinese Restaurant  0.18
2                         Indian Restaurant  0.09
3  Residential Building (Apartment / Condo)  0.09
4                             Train Station  0.09


----Choa Chu Kang----
                 venue  freq
0          Coffee Shop  0.14
1  Fast Food Restaurant  0.10
2       Sandwich Place  0.05
3                 Park  0.05
4     Basketball Court  0.05


----City Hall----
         venue  freq
0        Hotel  0.07
1         Café  0.06
2  Cocktail Bar  0.04
3       Lounge  0.03
4   Coffee Shop  0.03


----Clarke Quay----
                 venue  freq
0            Nightclub  0.05
1                  Bar  0.05
2  Japanese Restaurant  0.05
3               Bakery  0.04
4                Hotel  0.04


----Clementi----
              venue  freq
0       Coffee Shop  0.09
1        Food Court  0.08
2       Bus Station  0.05
3      Noodle House  0.05
4   Asian Restaurant  0.05


----Commonwealth----
                venue  freq
0         Coffee Shop  0.10
1        Noodle House  0.06
2  Chinese Restaurant  0.06
3         Bus Station  0.06
```

```
4      Asian Restaurant  0.06


----Dakota----
                venue  freq
0         Noodle House  0.27
1   Chinese Restaurant  0.12
2     Asian Restaurant  0.08
3   Seafood Restaurant  0.08
4            BBQ Joint  0.08


----Dhoby Ghaut----
                  venue  freq
0                  Café  0.11
1                 Hotel  0.07
2                  Park  0.04
3   Japanese Restaurant  0.04
4          Karaoke Bar   0.02


----Dover----
                  venue  freq
0     College Cafeteria  0.25
1   Fast Food Restaurant  0.25
2           Coffee Shop  0.25
3        Sandwich Place  0.25
4                   ATM  0.00


----Downtown----
                  venue  freq
0           Coffee Shop  0.10
1   Japanese Restaurant  0.07
2                  Café  0.06
3    Chinese Restaurant  0.06
4        Sandwich Place  0.05


----Esplanade----
              venue  freq
0             Hotel  0.11
1              Café  0.04
2            Bakery  0.03
3    Clothing Store  0.03
4            Lounge  0.03


----Eunos----
```

```
                  venue  freq
0  Chinese Restaurant  0.17
1        Noodle House  0.11
2         Coffee Shop  0.11
3         Bus Station  0.11
4          Food Court  0.06
```

----Expo----
```
                   venue  freq
0                   Café  0.10
1            Coffee Shop  0.08
2     Chinese Restaurant  0.06
3    Japanese Restaurant  0.06
4  Fast Food Restaurant   0.06
```

----Farrer Park----
```
                          venue  freq
0             Indian Restaurant  0.13
1            Chinese Restaurant  0.12
2                          Café  0.10
3  Vegetarian / Vegan Restaurant  0.07
4                         Hotel  0.05
```

----Farrer Road----
```
                  venue  freq
0    Chinese Restaurant  0.15
1          Noodle House  0.08
2  Indonesian Restaurant  0.08
3  Performing Arts Venue  0.08
4         Metro Station  0.08
```

----Fort Canning----
```
                  venue  freq
0  Japanese Restaurant  0.14
1                Hotel  0.07
2                  Bar  0.05
3               Bakery  0.04
4             Nightclub  0.04
```

----Geylang Bahru----
```
                venue  freq
0         Coffee Shop  0.25
1    Department Store  0.12
2          Food Court  0.12
```

```
3           Supermarket  0.12
4                  Café  0.12


----Gul Circle----
                  venue  freq
0     Electronics Store  0.25
1         Train Station  0.25
2                  Park  0.25
3            Coffee Shop  0.25
4    Peruvian Restaurant  0.00


----HarbourFront----
                  venue  freq
0     Chinese Restaurant  0.07
1    Japanese Restaurant  0.06
2        Toy / Game Store  0.04
3         Clothing Store  0.04
4             Coffee Shop  0.04


----Haw Par Villa----
                  venue  freq
0     Miscellaneous Shop  0.11
1       Asian Restaurant  0.11
2             Food Court  0.11
3             Theme Park  0.11
4           Metro Station  0.11


----Hillview----
              venue  freq
0              Café  0.14
1       Supermarket  0.07
2               Gym  0.07
3     Shopping Mall  0.07
4        Coffee Shop  0.07


----Holland Village----
                  venue  freq
0               Bakery  0.10
1        Ice Cream Shop  0.07
2                   Bar  0.07
3     Italian Restaurant  0.05
4         Cosmetics Shop  0.05
```

```
----Hougang----
                  venue  freq
0                  Café  0.08
1  Fast Food Restaurant  0.08
2    Chinese Restaurant  0.08
3           Coffee Shop  0.08
4            Food Court  0.08


----Jalan Besar----
                venue  freq
0   Indian Restaurant  0.23
1  Chinese Restaurant  0.10
2               Hotel  0.08
3                Café  0.06
4              Hostel  0.04


----Joo Koon----
                  venue  freq
0  Fast Food Restaurant  0.17
1           Bus Station  0.09
2         Movie Theater  0.09
3                Museum  0.04
4         Shopping Mall  0.04


----Jurong East----
                venue  freq
0  Japanese Restaurant  0.08
1   Chinese Restaurant  0.07
2           Food Court  0.05
3          Coffee Shop  0.05
4        Shopping Mall  0.04


----Kaki Bukit----
             venue  freq
0      Coffee Shop  0.18
1       Food Court  0.18
2       Skate Park  0.09
3         Boutique  0.09
4   Motorcycle Shop  0.09


----Kallang----
          venue  freq
0    Food Court  0.17
1     BBQ Joint  0.11
```

```
2       Rock Club  0.11
3          Hostel  0.11
4     Snack Place  0.11


----Kembangan----
                   venue  freq
0  Chinese Restaurant  0.14
1   Indian Restaurant  0.14
2         Coffee Shop  0.09
3     Asian Restaurant  0.09
4          Food Court  0.05


----Kent Ridge----
                venue  freq
0        Coffee Shop  0.16
1               Café  0.11
2          Restaurant  0.05
3           Beer Bar  0.05
4  Kebab Restaurant  0.05


----Khatib----
                venue  freq
0        Coffee Shop  0.12
1            Bus Stop  0.08
2              Bakery  0.08
3  Asian Restaurant  0.08
4        Supermarket  0.08


----King Albert Park----
                   venue  freq
0         Bus Station  0.19
1  Seafood Restaurant  0.05
2  Italian Restaurant  0.05
3          Food Court  0.05
4  Chinese Restaurant  0.05


----Kovan----
                   venue  freq
0  Chinese Restaurant  0.14
1         Coffee Shop  0.09
2        Noodle House  0.09
3          Food Court  0.09
4                Café  0.07
```

```
----Kranji----
           venue  freq
0         Stadium  0.12
1   Dessert Shop  0.12
2       Racetrack  0.12
3   Noodle House  0.12
4        Bus Line  0.12


----Labrador Park----
                 venue  freq
0   Chinese Restaurant  0.06
1                Trail  0.06
2                 Café  0.06
3  Fast Food Restaurant  0.06
4          Coffee Shop  0.06


----Lakeside----
               venue  freq
0         Food Court  0.17
1              Trail  0.17
2        Snack Place  0.17
3  Convenience Store  0.17
4        Coffee Shop  0.17


----Lavender----
                 venue  freq
0          Coffee Shop  0.11
1  Fast Food Restaurant  0.06
2         Noodle House  0.06
3    Indian Restaurant  0.04
4       Bed & Breakfast  0.04


----Little India----
                          venue  freq
0             Indian Restaurant  0.58
1  Vegetarian / Vegan Restaurant  0.08
2                          Food  0.03
3                           Gym  0.03
4                        Bakery  0.03


----Lorong Chuan----
              venue  freq
0        Bus Station  0.38
```

```
1                       Café  0.25
2                   Bus Line  0.12
3                      Trail  0.12
4    Indonesian Restaurant  0.12


----MacPherson----
                       venue  freq
0    Furniture / Home Store  0.18
1                    Office  0.09
2                Hobby Shop  0.09
3                Food Court  0.09
4             Metro Station  0.09


----Marina Bay----
                       venue  freq
0                       Pub  0.08
1      Government Building  0.04
2                 Gastropub  0.04
3                    Museum  0.04
4          Harbor / Marina  0.04


----Marina South Pier----
                       venue  freq
0             Boat or Ferry  0.38
1      Mexican Restaurant  0.12
2           History Museum  0.12
3             Metro Station  0.12
4      Seafood Restaurant  0.12


----Marsiling----
                     venue  freq
0             Food Court  0.14
1             Steakhouse  0.14
2          Grocery Store  0.14
3       Asian Restaurant  0.07
4             Coffee Shop  0.07


----Marymount----
                     venue  freq
0    Chinese Restaurant   0.2
1             Food Court   0.1
2                 Bakery   0.1
3            Bus Station   0.1
4            Supermarket   0.1
```

```
----Mattar----
                          venue  freq
0                    Coffee Shop  0.15
1  Vegetarian / Vegan Restaurant  0.15
2                     Food Court  0.15
3                    Bus Station  0.10
4                         Bistro  0.05


----Mountbatten----
                     venue  freq
0              Noodle House  0.15
1                Food Court  0.10
2        Chinese Restaurant  0.06
3      Fast Food Restaurant  0.06
4              Dessert Shop  0.06


----Newton----
                   venue  freq
0     Chinese Restaurant  0.21
1     Seafood Restaurant  0.11
2              Hotel Bar  0.07
3                  Hotel  0.04
4    Gym / Fitness Center  0.04


----Nicoll Highway----
                   venue  freq
0         Thai Restaurant  0.13
1                   Hotel  0.09
2      Italian Restaurant  0.07
3   Vietnamese Restaurant  0.04
4              Food Court  0.04


----Novena----
                   venue  freq
0                    Café  0.12
1     Japanese Restaurant  0.07
2             Coffee Shop  0.07
3                   Hotel  0.06
4       Ramen Restaurant  0.04


----Orchard----
                 venue   freq
```

```
0             Boutique  0.09
1    Sushi Restaurant  0.06
2              Bakery  0.05
3               Hotel  0.05
4  Chinese Restaurant  0.05


----Outram Park----
                  venue  freq
0                  Café  0.12
1    Italian Restaurant  0.08
2  Japanese Restaurant  0.07
3           Coffee Shop  0.05
4              Wine Bar  0.05


----Pasir Panjang----
                    venue  freq
0              Food Court   0.1
1      Chinese Restaurant   0.1
2         Thai Restaurant   0.1
3        Asian Restaurant   0.1
4  Furniture / Home Store   0.1


----Pasir Ris----
                   venue  freq
0             Food Court  0.08
1  Fast Food Restaurant  0.08
2            Coffee Shop  0.05
3         Sandwich Place  0.05
4                 Diner  0.05


----Paya Lebar----
                  venue  freq
0         Shopping Mall  0.09
1  Fast Food Restaurant  0.07
2      Asian Restaurant  0.06
3            Food Court  0.06
4           Coffee Shop  0.04


----Pioneer----
                  venue  freq
0           Bus Station  0.12
1            Food Court  0.06
2  Fast Food Restaurant  0.06
3               Stadium  0.06
```

```
4          Supermarket  0.06


----Potong Pasir----
                  venue  freq
0   Chinese Restaurant  0.21
1    Convenience Store  0.09
2          Bus Station  0.06
3           Food Court  0.06
4           Coffee Shop  0.06


----Promenade----
                  venue  freq
0  Japanese Restaurant  0.09
1                Hotel  0.09
2            Hotel Bar  0.06
3               Buffet  0.06
4                 Café  0.04


----Punggol----
                   venue  freq
0    Japanese Restaurant  0.09
1  Fast Food Restaurant  0.04
2           Supermarket  0.04
3                  Café  0.04
4    Chinese Restaurant  0.04


----Queenstown----
                  venue  freq
0           Food Court  0.25
1         Noodle House  0.19
2  Chinese Restaurant  0.12
3              Stadium  0.06
4                  Spa  0.06


----Raffles Place----
                  venue  freq
0                 Café  0.07
1  Japanese Restaurant  0.05
2          Cocktail Bar  0.05
3           Coffee Shop  0.05
4  Chinese Restaurant  0.04


----Redhill----
```

```
              venue   freq
0  Chinese Restaurant  0.35
1         Coffee Shop  0.12
2                Park  0.06
3   Convenience Store  0.06
4       Train Station  0.06


----Rochor----
                          venue   freq
0              Indian Restaurant  0.16
1  Vegetarian / Vegan Restaurant  0.09
2                           Café  0.09
3             Chinese Restaurant  0.04
4                    Art Gallery  0.04


----Sembawang----
                venue   freq
0         Coffee Shop  0.14
1   Convenience Store  0.14
2    Asian Restaurant  0.07
3         Supermarket  0.07
4  Chinese Restaurant  0.07


----Sengkang----
                 venue   freq
0  Fast Food Restaurant  0.11
1           Bus Station  0.09
2      Asian Restaurant  0.06
3            Restaurant  0.06
4           Coffee Shop  0.06


----Serangoon----
                venue   freq
0         Coffee Shop  0.10
1       Clothing Store  0.07
2  Chinese Restaurant  0.07
3    Korean Restaurant  0.05
4     Asian Restaurant  0.05


----Simei----
                venue   freq
0  Japanese Restaurant  0.10
1          Coffee Shop  0.10
2   Chinese Restaurant  0.10
```

```
3                 Juice Bar  0.05
4                    Bakery  0.05


----Sixth Avenue----
                      venue  freq
0                    Bakery  0.08
1         Indian Restaurant  0.08
2                  Wine Bar  0.06
3                 BBQ Joint  0.06
4                Food Court  0.06


----Somerset----
                      venue  freq
0                     Hotel  0.07
1             Shopping Mall  0.07
2       Japanese Restaurant  0.06
3            Clothing Store  0.05
4             Ice Cream Shop  0.03


----Stadium----
                      venue  freq
0                      Café  0.07
1                   Stadium  0.07
2                Soup Place  0.04
3            Clothing Store  0.04
4                Coffee Shop  0.04


----Stevens----
                      venue  freq
0                      Café   0.2
1                     Diner   0.2
2              Dessert Shop   0.1
3       Japanese Restaurant   0.1
4         Italian Restaurant   0.1


----Tai Seng----
                      venue  freq
0                Food Court  0.12
1        Chinese Restaurant  0.12
2                      Café  0.10
3        Seafood Restaurant  0.07
4          Asian Restaurant  0.05
```

```
----Tampines----
              venue  freq
0            Bakery  0.07
1              Café  0.06
2       Coffee Shop  0.05
3   Bubble Tea Shop  0.04
4  Sushi Restaurant  0.04


----Tampines East----
                 venue  freq
0          Coffee Shop  0.25
1        Deli / Bodega  0.12
2       Sandwich Place  0.12
3         Dessert Shop  0.12
4  Fast Food Restaurant  0.12


----Tampines West----
                  venue  freq
0            Restaurant  0.09
1       Halal Restaurant  0.09
2           Coffee Shop  0.09
3  Fast Food Restaurant  0.09
4     Indian Restaurant  0.05


----Tan Kah Kee----
                venue  freq
0                Café  0.13
1     Thai Restaurant  0.07
2    Asian Restaurant  0.07
3        Train Station  0.07
4  Frozen Yogurt Shop  0.07


----Tanah Merah----
              venue  freq
0      Noodle House  0.14
1        Bus Station  0.10
2   Asian Restaurant  0.10
3   Malay Restaurant  0.10
4      Moving Target  0.05


----Tanjong Pagar----
                 venue  freq
0          Coffee Shop  0.11
1  Japanese Restaurant  0.07
```

2	Bakery	0.06
3	Hotel	0.05
4	Cocktail Bar	0.04

----Telok Ayer----

	venue	freq
0	Café	0.07
1	Japanese Restaurant	0.07
2	Cocktail Bar	0.07
3	Coffee Shop	0.06
4	Korean Restaurant	0.04

----Telok Blangah----

	venue	freq
0	Food Court	0.10
1	Metro Station	0.05
2	Japanese Restaurant	0.05
3	Coffee Shop	0.05
4	Board Shop	0.05

----Tiong Bahru----

	venue	freq
0	Chinese Restaurant	0.24
1	Coffee Shop	0.10
2	Café	0.07
3	Sushi Restaurant	0.07
4	Japanese Restaurant	0.07

----Toa Payoh----

	venue	freq
0	Coffee Shop	0.11
1	Snack Place	0.11
2	Dessert Shop	0.07
3	Food Court	0.07
4	Chinese Restaurant	0.07

----Tuas Crescent----

	venue	freq
0	Harbor / Marina	0.2
1	Train Station	0.2
2	Ski Area	0.2
3	Cafeteria	0.2
4	Food Truck	0.2

```
----Tuas Link----
                 venue  freq
0          Sports Club  0.14
1  Sporting Goods Shop  0.14
2            Gastropub  0.14
3          Bus Station  0.14
4   Chinese Restaurant  0.14


----Ubi----
                venue  freq
0          Food Court  0.25
1     Asian Restaurant  0.17
2  Chinese Restaurant  0.17
3      Motorcycle Shop  0.08
4          Coffee Shop  0.08


----Upper Changi----
               venue  freq
0  Convenience Store  0.18
1                Gym  0.09
2               Lake  0.09
3        Bus Station  0.09
4          Cafeteria  0.09


----Woodlands----
                venue  freq
0                Café  0.06
1          Coffee Shop  0.06
2  Japanese Restaurant  0.06
3          Pizza Place  0.04
4   Chinese Restaurant  0.04


----Woodleigh----
                  venue  freq
0                  Café   0.2
1  Thrift / Vintage Store   0.1
2       Asian Restaurant   0.1
3            Bus Station   0.1
4                  Park   0.1


----Yew Tee----
                  venue  freq
0  Fast Food Restaurant  0.22
```

```
1       Shopping Mall   0.11
2               Diner   0.11
3          Food Court   0.11
4   Japanese Restaurant  0.11


----Yio Chu Kang----
                venue  freq
0          Food Court  0.12
1   Chinese Restaurant  0.12
2   Convenience Store  0.06
3            Bus Stop  0.06
4                Café  0.06


----Yishun----
                venue  freq
0   Chinese Restaurant  0.06
1          Food Court  0.06
2   Fried Chicken Joint  0.04
3          Coffee Shop  0.04
4     Hainan Restaurant  0.04


----one-north----
                venue  freq
0                Café  0.15
1          Coffee Shop  0.10
2          Salad Place  0.05
3   Italian Restaurant  0.05
4          Food Court  0.05
```

In [29]:
```python
#Sort venues in descending order
def return_most_common_venues(row, num_top_venues):
    row_categories = row.iloc[1:]
    row_categories_sorted = row_categories.sort_values(ascending=False)
    return row_categories_sorted.index.values[0:num_top_venues]
```

```
In [30]: num_top_venues = 10
         indicators = ['st', 'nd', 'rd']
         # create columns according to number of top venues
         columns = ['Station']
         for ind in np.arange(num_top_venues):
             try:
                 columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
             except:
                 columns.append('{}th Most Common Venue'.format(ind+1))
         # create a new dataframe
         station_venues_sorted = pd.DataFrame(columns=columns)
         station_venues_sorted['Station'] = station_grouped['Station']
         for ind in np.arange(station_grouped.shape[0]):
             station_venues_sorted.iloc[ind, 1:] = return_most_common_venues(station_grouped.iloc[ind, :], num_top_venues)
         station_venues_sorted.head()
```

Out[30]:

	Station	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Admiralty	Supermarket	Food Truck	Snack Place	Park	Bus Station	Food Court	Asian Restaurant	Coffee Shop	Flea Market	Flower Shop
1	Aljunied	Chinese Restaurant	Noodle House	Asian Restaurant	Vegetarian / Vegan Restaurant	Dim Sum Restaurant	Coffee Shop	Bus Station	Food Court	Seafood Restaurant	Breakfast Spot
2	Ang Mo Kio	Coffee Shop	Dessert Shop	Food Court	Japanese Restaurant	Supermarket	Bubble Tea Shop	Snack Place	Miscellaneous Shop	Modern European Restaurant	Sushi Restaurant
3	Bartley	Noodle House	Metro Station	Café	Pool	Fish & Chips Shop	Flea Market	Flower Shop	Food	Food Court	Food Service
4	Bayfront	Hotel	Boutique	Tea Room	Lounge	Bar	Italian Restaurant	Waterfront	Bridge	Japanese Restaurant	Theater

```
In [32]:  station_grouped_clustering = station_grouped.drop('Station', 1)
          Error =[]
          for i in range(2, 8):
              kmeans = KMeans(n_clusters = i).fit(station_grouped_clustering)
              kmeans.fit(station_grouped_clustering)
              Error.append(kmeans.inertia_)
          import matplotlib.pyplot as plt
          plt.plot(range(2, 8), Error)
          plt.title('Elbow method')
          plt.xlabel('No of clusters')
          plt.ylabel('Error')
          plt.show()
```
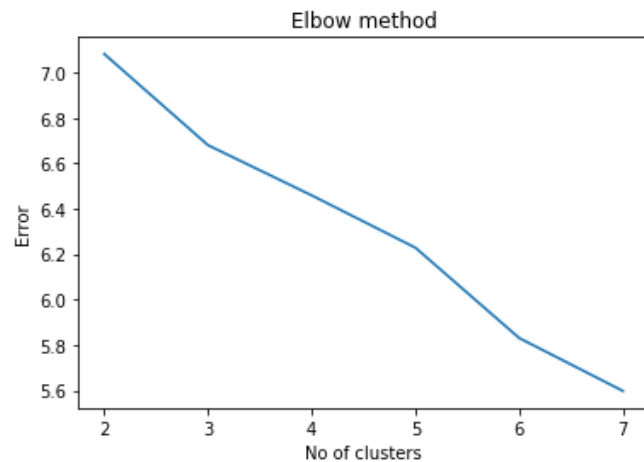


```
In [33]:  # set number of clusters
          kclusters = 6
          station_grouped_clustering = station_grouped.drop('Station', 1)
          # run k-means clustering
          kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(station_grouped_clustering)
          # check cluster labels generated for each row in the dataframe
          kmeans.labels_[0:10]
```

Out[33]: array([5, 0, 1, 4, 4, 1, 1, 1, 4, 4])

```
In [34]:  # add clustering labels
          station_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)
          station_merged = df_MRT
          # merge station_grouped with station_data to add latitude/longitude for each station
          station_merged = station_merged.join(station_venues_sorted.set_index('Station'), on='station_name')
          station_merged.head() # check dataframe
```

Out[34]:

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Mos Commor Venue
0	Jurong East	MRT	1.333207	103.742308	1.0	Japanese Restaurant	Chinese Restaurant	Coffee Shop	Food Court	Shopping Mall	Sushi Restaurant	Steakhouse	Korean Restaurant	Clothing Store
1	Bukit Batok	MRT	1.349069	103.749596	1.0	Coffee Shop	Chinese Restaurant	Food Court	Fast Food Restaurant	Grocery Store	Sandwich Place	Bookstore	Bowling Alley	Shopping Mall
2	Bukit Gombak	MRT	1.359043	103.751863	5.0	Food Court	Convenience Store	Stadium	Vegetarian / Vegan Restaurant	Steakhouse	Supermarket	Flea Market	Chinese Restaurant	Fast Food Restauran
3	Choa Chu Kang	MRT	1.385417	103.744316	5.0	Coffee Shop	Fast Food Restaurant	Italian Restaurant	Bubble Tea Shop	Food Court	Supermarket	Sushi Restaurant	Shop & Service	Metro Station
4	Yew Tee	MRT	1.397383	103.747523	1.0	Fast Food Restaurant	Japanese Restaurant	Diner	Pool	Food Court	Shopping Mall	Café	Sandwich Place	Yunnan Restauran

```
In [37]: station_merged.isnull()
```

Out[37]:

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
5	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
6	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
7	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
8	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
9	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
10	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
11	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
12	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
13	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
14	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
15	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
16	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
17	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
18	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
19	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
20	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
21	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
22	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
23	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
24	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
25	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
26	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
27	False	False	False	False	True	True	True	True	True	True	True	True	True	True	True
28	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
29	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
89	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
90	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
91	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
92	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
93	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
94	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
95	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
96	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
97	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
98	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
99	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
100	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
101	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
102	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
103	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
104	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
105	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
106	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
107	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
108	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
109	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
110	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
111	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
112	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
113	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
114	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
115	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
116	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
117	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
118	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

119 rows × 15 columns

```
In [39]: station_merged.dropna(inplace=True)
         station_merged.isnull()
```

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
5	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
6	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
7	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
8	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
9	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
10	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
11	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
12	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
13	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
14	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
15	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
16	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
17	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
18	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
19	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
20	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
21	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
22	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
23	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
24	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
25	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

|	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
26	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
28	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
29	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
30	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
89	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
90	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
91	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
92	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
93	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
94	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
95	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
96	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
97	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
98	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
99	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
100	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
101	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
102	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
103	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
104	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
105	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
106	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
107	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
108	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
109	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

	station_name	type	lat	lng	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
110	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
111	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
112	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
113	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
114	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
115	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
116	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
117	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
118	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False

118 rows × 15 columns

In [40]:
```python
#cast cluster labels as integer for map
station_merged['Cluster Labels'] = station_merged['Cluster Labels'].astype(int)
```

```
In [42]:  #visualise results
          # create map
          map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

          # set color scheme for the clusters
          x = np.arange(kclusters)
          ys = [i + x + (i*x)**2 for i in range(kclusters)]
          colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
          rainbow = [colors.rgb2hex(i) for i in colors_array]

          # add markers to the map
          markers_colors = []
          for lat, lon, poi, cluster in zip(station_merged['lat'], station_merged['lng'], station_merged['station_name'], station_merged['Cluster Label
          s']):
              label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
              folium.CircleMarker(
              [lat, lon],
              radius=5,
              popup=label,
              color=rainbow[cluster - 1],
              fill=True,
              fill_color=rainbow[cluster - 1],
              fill_opacity=0.7).add_to(map_clusters)

          map_clusters
```
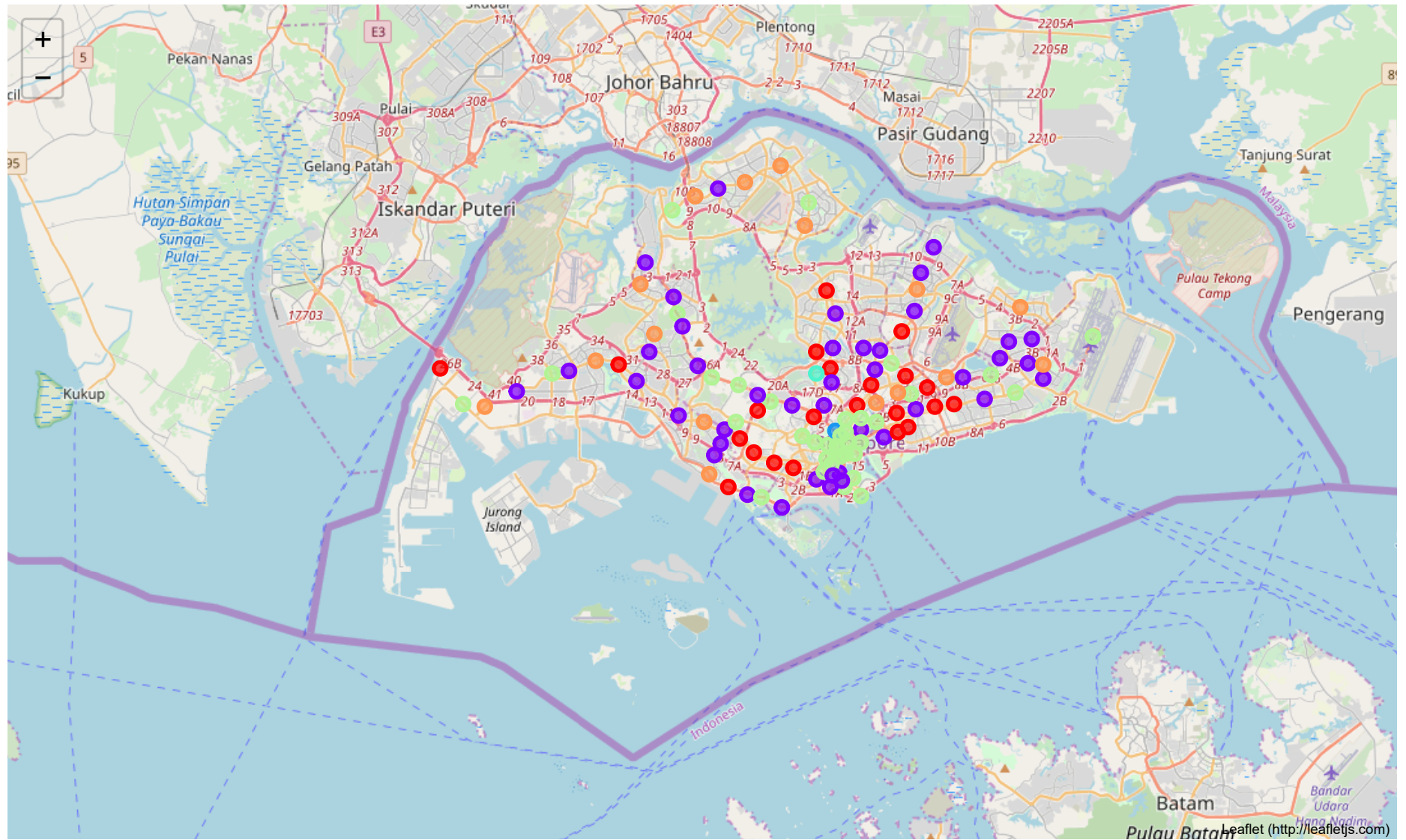
```
In [43]: #Examine the clusters - cluster 1
         station_merged.loc[station_merged['Cluster Labels'] == 0, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

Out[43]:

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
12	Yio Chu Kang	Chinese Restaurant	Food Court	Noodle House	Café	Seafood Restaurant	Fast Food Restaurant	Coffee Shop	Vegetarian / Vegan Restaurant	Tennis Court	College Auditorium
15	Braddell	Noodle House	Food Court	Chinese Restaurant	Café	Bakery	Hakka Restaurant	Thai Restaurant	Seafood Restaurant	Asian Restaurant	Fast Food Restaurant
18	Newton	Chinese Restaurant	Seafood Restaurant	Hotel Bar	Japanese Restaurant	Convenience Store	Café	Food Court	Grocery Store	Gym / Fitness Center	Thai Restaurant
26	Tuas Link	Harbor / Marina	Train Station	Gastropub	Bus Station	Chinese Restaurant	Sporting Goods Shop	Sports Club	Discount Store	Dive Bar	Flower Shop
34	Chinese Garden	Chinese Restaurant	Coffee Shop	Café	Chinese Breakfast Place	Residential Building (Apartment / Condo)	Indian Restaurant	Asian Restaurant	Train Station	Food Court	Food Service
38	Commonwealth	Coffee Shop	Noodle House	Asian Restaurant	Food Court	Bakery	Snack Place	Chinese Restaurant	Bus Station	Garden	Candy Store
39	Queenstown	Food Court	Noodle House	Chinese Restaurant	Italian Restaurant	Train Station	Stadium	Spa	Café	Seafood Restaurant	Pool
40	Redhill	Chinese Restaurant	Coffee Shop	Hainan Restaurant	Gym	Park	Pool	Convenience Store	Malay Restaurant	Asian Restaurant	Train Station
41	Tiong Bahru	Chinese Restaurant	Coffee Shop	Japanese Restaurant	Café	Sushi Restaurant	Food Court	Bakery	Noodle House	Supermarket	Park
47	Aljunied	Chinese Restaurant	Noodle House	Asian Restaurant	Vegetarian / Vegan Restaurant	Dim Sum Restaurant	Coffee Shop	Bus Station	Food Court	Seafood Restaurant	Breakfast Spot
49	Eunos	Chinese Restaurant	Noodle House	Bus Station	Coffee Shop	Bubble Tea Shop	Asian Restaurant	Gym	Food Court	Train Station	Vegetarian / Vegan Restaurant
50	Kembangan	Chinese Restaurant	Indian Restaurant	Coffee Shop	Asian Restaurant	Noodle House	Diner	Convenience Store	Gastropub	Food Court	Spa

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
63	Boon Keng	Chinese Restaurant	Noodle House	Coffee Shop	Fast Food Restaurant	Supermarket	Bakery	Vegetarian / Vegan Restaurant	Sandwich Place	Asian Restaurant	Shopping Mall
64	Potong Pasir	Chinese Restaurant	Convenience Store	Fast Food Restaurant	Coffee Shop	Food Court	Bus Station	Gym / Fitness Center	Snack Place	Martial Arts Dojo	Market
67	Kovan	Chinese Restaurant	Food Court	Coffee Shop	Noodle House	Asian Restaurant	Café	Supermarket	Bakery	Snack Place	Bowling Green
77	Mountbatten	Noodle House	Food Court	Fast Food Restaurant	Dessert Shop	Chinese Restaurant	Tennis Court	Café	Seafood Restaurant	Asian Restaurant	BBQ Joint
78	Dakota	Noodle House	Chinese Restaurant	Seafood Restaurant	Asian Restaurant	BBQ Joint	Coffee Shop	Snack Place	Dessert Shop	Food	Food Court
80	Tai Seng	Food Court	Chinese Restaurant	Café	Seafood Restaurant	Asian Restaurant	Thai Restaurant	Furniture / Home Store	Japanese Restaurant	Coffee Shop	Candy Store
83	Marymount	Chinese Restaurant	Burger Joint	Thai Restaurant	Supermarket	Bus Station	Bakery	Food Court	Outdoors & Recreation	Coffee Shop	Yunnan Restaurant
86	Farrer Road	Chinese Restaurant	Furniture / Home Store	Plaza	Betting Shop	Performing Arts Venue	Bakery	Food Court	Metro Station	Gym / Fitness Center	Pool
91	Pasir Panjang	Food Court	Chinese Restaurant	Thai Restaurant	Asian Restaurant	Furniture / Home Store	Coffee Shop	Monument / Landmark	BBQ Joint	Vietnamese Restaurant	Seafood Restaurant
112	Ubi	Food Court	Chinese Restaurant	Asian Restaurant	Motorcycle Shop	Diner	Restaurant	Supermarket	Coffee Shop	Fish & Chips Shop	Flea Market

```
In [44]: #Examine the clusters - cluster 2
         station_merged.loc[station_merged['Cluster Labels'] == 1, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

Out[44]:

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Jurong East	Japanese Restaurant	Chinese Restaurant	Coffee Shop	Food Court	Shopping Mall	Sushi Restaurant	Steakhouse	Korean Restaurant	Clothing Store	Bakery
1	Bukit Batok	Coffee Shop	Chinese Restaurant	Food Court	Fast Food Restaurant	Grocery Store	Sandwich Place	Bookstore	Bowling Alley	Shopping Mall	Multiplex
4	Yew Tee	Fast Food Restaurant	Japanese Restaurant	Diner	Pool	Food Court	Shopping Mall	Café	Sandwich Place	Yunnan Restaurant	Food Service
7	Woodlands	Café	Coffee Shop	Japanese Restaurant	Fast Food Restaurant	Frozen Yogurt Shop	Chinese Restaurant	Clothing Store	Asian Restaurant	Shopping Mall	Indian Restaurant
13	Ang Mo Kio	Coffee Shop	Dessert Shop	Food Court	Japanese Restaurant	Supermarket	Bubble Tea Shop	Snack Place	Miscellaneous Shop	Modern European Restaurant	Sushi Restaurant
14	Bishan	Food Court	Coffee Shop	Café	Ice Cream Shop	Japanese Restaurant	Bubble Tea Shop	Chinese Restaurant	Supermarket	Cosmetics Shop	Bookstore
16	Toa Payoh	Snack Place	Coffee Shop	Chinese Restaurant	Food Court	Dessert Shop	Grocery Store	Bookstore	Monument / Landmark	Park	Fast Food Restaurant
17	Novena	Café	Coffee Shop	Japanese Restaurant	Hotel	Italian Restaurant	Ramen Restaurant	Chinese Restaurant	Dessert Shop	Supermarket	Sporting Goods Shop
23	Raffles Place	Café	Japanese Restaurant	Coffee Shop	Cocktail Bar	Hotel	Chinese Restaurant	Gym / Fitness Center	Salad Place	Italian Restaurant	Modern European Restaurant
30	Joo Koon	Fast Food Restaurant	Movie Theater	Bus Station	Snack Place	Gym / Fitness Center	Go Kart Track	Shopping Mall	Bakery	Coffee Shop	Chinese Breakfast Place
32	Boon Lay	Asian Restaurant	Japanese Restaurant	Fast Food Restaurant	Dessert Shop	Chinese Restaurant	Coffee Shop	Karaoke Bar	Café	Park	Snack Place
35	Clementi	Coffee Shop	Food Court	Bus Station	Dessert Shop	Noodle House	Chinese Restaurant	Asian Restaurant	Electronics Store	Fried Chicken Joint	Chinese Breakfast Place
37	Buona Vista	Chinese Restaurant	Japanese Restaurant	Food Court	Indian Restaurant	Bakery	Coffee Shop	Salad Place	Bistro	Snack Place	BBQ Joint

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
42	Outram Park	Café	Italian Restaurant	Japanese Restaurant	Coffee Shop	Wine Bar	Chinese Restaurant	Asian Restaurant	Tapas Restaurant	Australian Restaurant	Food Court
43	Tanjong Pagar	Coffee Shop	Japanese Restaurant	Bakery	Hotel	Café	Cocktail Bar	Asian Restaurant	Korean Restaurant	Bar	Salad Place
45	Lavender	Coffee Shop	Fast Food Restaurant	Noodle House	Indian Restaurant	Café	Bed & Breakfast	Restaurant	Steakhouse	Chinese Restaurant	Pool
48	Paya Lebar	Shopping Mall	Fast Food Restaurant	Food Court	Asian Restaurant	Supermarket	Coffee Shop	Hotpot Restaurant	Steakhouse	Halal Restaurant	Dessert Shop
51	Bedok	Coffee Shop	Sandwich Place	Japanese Restaurant	Sushi Restaurant	Food Court	Asian Restaurant	Chinese Restaurant	Supermarket	Café	Fast Food Restaurant
53	Simei	Japanese Restaurant	Coffee Shop	Chinese Restaurant	Sandwich Place	Video Store	Fast Food Restaurant	Shabu-Shabu Restaurant	Shopping Mall	Food	Bakery
54	Tampines	Bakery	Café	Coffee Shop	Japanese Restaurant	Fast Food Restaurant	Chinese Restaurant	Bubble Tea Shop	Sushi Restaurant	Shopping Mall	Gym
56	Expo	Café	Coffee Shop	Fast Food Restaurant	Chinese Restaurant	Japanese Restaurant	Sporting Goods Shop	Food Court	Indian Restaurant	Sandwich Place	Hotel
58	HarbourFront	Chinese Restaurant	Japanese Restaurant	Fast Food Restaurant	Clothing Store	Toy / Game Store	Coffee Shop	Multiplex	Bakery	Food Court	Shoe Store
65	Woodleigh	Café	Metro Station	Chinese Restaurant	Thrift / Vintage Store	Park	General Entertainment	Convenience Store	Bus Station	Asian Restaurant	Food Stand
66	Serangoon	Coffee Shop	Chinese Restaurant	Clothing Store	Korean Restaurant	Ice Cream Shop	Asian Restaurant	Noodle House	Japanese Restaurant	Fast Food Restaurant	Supermarket
68	Hougang	Fast Food Restaurant	Coffee Shop	Café	Food Court	Chinese Restaurant	Shopping Mall	Supermarket	Dessert Shop	Pharmacy	Sandwich Place
70	Sengkang	Fast Food Restaurant	Bus Station	Asian Restaurant	Restaurant	Coffee Shop	Chinese Restaurant	Food Court	Supermarket	Sandwich Place	Sculpture Garden
71	Punggol	Japanese Restaurant	Café	Supermarket	Fast Food Restaurant	Chinese Restaurant	Food Service	Sushi Restaurant	Steakhouse	Breakfast Spot	Mobile Phone Shop

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
76	Stadium	Café	Stadium	Coffee Shop	Ice Cream Shop	Clothing Store	Frozen Yogurt Shop	Supermarket	Soup Place	Japanese Restaurant	Deli / Bodega
82	Lorong Chuan	Bus Station	Café	Indonesian Restaurant	Trail	Bus Line	Yunnan Restaurant	Food Truck	Flea Market	Flower Shop	Food
88	one-north	Café	Coffee Shop	Food Court	Bus Station	Noodle House	Italian Restaurant	Sandwich Place	Salad Place	Filipino Restaurant	Fried Chicken Joint
89	Kent Ridge	Coffee Shop	Café	Snack Place	Food Court	Sandwich Place	Pharmacy	Beer Bar	Restaurant	Vietnamese Restaurant	Hong Kong Restaurant
92	Labrador Park	Sushi Restaurant	Chinese Restaurant	Coffee Shop	Fast Food Restaurant	Trail	Café	Sandwich Place	Salad Place	Metro Station	Supermarket
95	Bukit Panjang	Café	Fast Food Restaurant	Asian Restaurant	Sushi Restaurant	Coffee Shop	American Restaurant	Bus Station	Shopping Mall	Diner	Sandwich Place
97	Hillview	Café	Pool	Supermarket	Shopping Mall	Gym	Coffee Shop	Japanese Restaurant	Health Food Store	Dessert Shop	Cantonese Restaurant
98	Beauty World	Chinese Restaurant	Café	Korean Restaurant	Food Court	Shopping Mall	Asian Restaurant	Thai Restaurant	Bakery	Indian Restaurant	Dim Sum Restaurant
101	Tan Kah Kee	Café	Japanese Restaurant	Coffee Shop	Frozen Yogurt Shop	French Restaurant	Supermarket	Gourmet Shop	Shopping Mall	Thai Restaurant	Malay Restaurant
102	Stevens	Diner	Café	Japanese Restaurant	Moving Target	Sandwich Place	Fast Food Restaurant	Italian Restaurant	Dessert Shop	Dim Sum Restaurant	French Restaurant
104	Downtown	Coffee Shop	Japanese Restaurant	Café	Chinese Restaurant	Sandwich Place	Hotel	Gym / Fitness Center	Food Court	Bar	Bakery
105	Telok Ayer	Café	Japanese Restaurant	Cocktail Bar	Coffee Shop	Gym / Fitness Center	Hotel	Chinese Restaurant	Food Court	Wine Bar	Restaurant
114	Bedok North	Bus Line	Food Court	Bus Station	Café	Pet Store	Laundromat	Fast Food Restaurant	Harbor / Marina	Sandwich Place	Coffee Shop
116	Tampines West	Halal Restaurant	Fast Food Restaurant	Coffee Shop	Restaurant	Vegetarian / Vegan Restaurant	Bus Stop	Bowling Alley	Gym	Gym / Fitness Center	Club House

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
117	Tampines East	Coffee Shop	Deli / Bodega	Sandwich Place	Fast Food Restaurant	Dessert Shop	Café	Pizza Place	Flea Market	Flower Shop	Food

In [45]:
```
#Examine the clusters - cluster 3
station_merged.loc[station_merged['Cluster Labels'] == 2, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

Out[45]:

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
61	Little India	Indian Restaurant	Vegetarian / Vegan Restaurant	Music Venue	Playground	Food	Motel	Coffee Shop	Bakery	Museum	Hospital

In [46]:
```
#Examine the clusters - cluster 4
station_merged.loc[station_merged['Cluster Labels'] == 3, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

Out[46]:

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
84	Caldecott	Flower Shop	Metro Station	Garden Center	Office	Ice Cream Shop	Café	Food Stand	Fish & Chips Shop	Flea Market	Food

In [47]:
```
#Examine the clusters - cluster 5
station_merged.loc[station_merged['Cluster Labels'] == 4, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

Out[47]:

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
5	Kranji	Stadium	Bakery	Dessert Shop	Bus Stop	Bus Line	Noodle House	Go Kart Track	Racetrack	Hotel Pool	Fast Food Restaurant
10	Yishun	Chinese Restaurant	Food Court	Fried Chicken Joint	Supermarket	Italian Restaurant	Coffee Shop	Hainan Restaurant	Jewelry Store	Bookstore	Mexican Restaurant
19	Orchard	Boutique	Sushi Restaurant	Shopping Mall	Hotel	Chinese Restaurant	Bakery	Cosmetics Shop	Coffee Shop	Bubble Tea Shop	Café
20	Somerset	Hotel	Shopping Mall	Japanese Restaurant	Clothing Store	Chinese Restaurant	Café	Ice Cream Shop	Coffee Shop	Boutique	Spa
21	Dhoby Ghaut	Café	Hotel	Park	Japanese Restaurant	Karaoke Bar	Restaurant	Movie Theater	Dessert Shop	Cosmetics Shop	Gift Shop
22	City Hall	Hotel	Café	Cocktail Bar	Lounge	Shopping Mall	French Restaurant	Japanese Restaurant	Coffee Shop	Bakery	Bookstore
24	Marina Bay	Pub	Building	Chinese Restaurant	Gym	Government Building	Sushi Restaurant	Brewery	Gastropub	Museum	Spanish Restaurant
25	Marina South Pier	Boat or Ferry	Pier	Metro Station	Seafood Restaurant	History Museum	Mexican Restaurant	Frozen Yogurt Shop	Food	Filipino Restaurant	Fish & Chips Shop
28	Tuas Crescent	Cafeteria	Train Station	Ski Area	Food Truck	Harbor / Marina	Food Service	Fish & Chips Shop	Flea Market	Flower Shop	Food
31	Pioneer	Bus Station	Japanese Restaurant	Supermarket	Seafood Restaurant	Fast Food Restaurant	Basketball Court	Shopping Mall	Bakery	Food Court	Gym
44	Bugis	Japanese Restaurant	Café	Bakery	Chinese Restaurant	Hotel	Cocktail Bar	Dessert Shop	Art Gallery	Thai Restaurant	Vegetarian / Vegan Restaurant
46	Kallang	Food Court	BBQ Joint	Hostel	Rock Club	Snack Place	Seafood Restaurant	Chinese Restaurant	Supermarket	Thai Restaurant	Soup Place
52	Tanah Merah	Noodle House	Asian Restaurant	Bus Station	Malay Restaurant	Clothing Store	Flower Shop	Food Court	Train Station	Moving Target	Steakhouse
57	Changi Airport	Airport Lounge	Boutique	Garden	Bakery	Airport	Duty-free Shop	Coffee Shop	Fast Food Restaurant	Shopping Mall	Sandwich Place

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
59	Chinatown	Chinese Restaurant	Food Court	Hostel	Hotel	Japanese Restaurant	Seafood Restaurant	Café	Vegetarian / Vegan Restaurant	Spa	Coffee Shop
60	Clarke Quay	Nightclub	Bar	Japanese Restaurant	Hotel	Bakery	Food Court	Yoga Studio	Lounge	Supermarket	Bistro
62	Farrer Park	Indian Restaurant	Chinese Restaurant	Café	Vegetarian / Vegan Restaurant	Hotel	Hostel	Asian Restaurant	Frozen Yogurt Shop	Multiplex	Seafood Restaurant
72	Bras Basah	Hotel	Café	Japanese Restaurant	Coffee Shop	Beer Bar	Bakery	French Restaurant	Movie Theater	Shopping Mall	Restaurant
73	Esplanade	Hotel	Café	Clothing Store	Coffee Shop	Bakery	Japanese Restaurant	Shopping Mall	Cocktail Bar	Dessert Shop	Lounge
74	Promenade	Hotel	Japanese Restaurant	Hotel Bar	Buffet	Café	Bakery	Hotel Pool	Clothing Store	Chinese Restaurant	Shopping Mall
75	Nicoll Highway	Thai Restaurant	Hotel	Italian Restaurant	Restaurant	Coffee Shop	Vietnamese Restaurant	French Restaurant	Café	Indonesian Restaurant	Food Court
79	MacPherson	Furniture / Home Store	Food Court	Office	Climbing Gym	Gym	Tea Room	Hobby Shop	Asian Restaurant	Metro Station	BBQ Joint
81	Bartley	Noodle House	Metro Station	Café	Pool	Fish & Chips Shop	Flea Market	Flower Shop	Food	Food Court	Food Service
85	Botanic Gardens	Café	Shopping Mall	Bakery	Noodle House	Asian Restaurant	Indian Restaurant	Satay Restaurant	Food Court	Fast Food Restaurant	French Restaurant
87	Holland Village	Bakery	Ice Cream Shop	Bar	Italian Restaurant	Thai Restaurant	Spa	Cosmetics Shop	Dessert Shop	Steakhouse	Chinese Restaurant
93	Telok Blangah	Food Court	Japanese Restaurant	Noodle House	Board Shop	Golf Course	Supermarket	Bus Line	Bus Station	Bus Stop	Shopping Mall
94	Bayfront	Hotel	Boutique	Tea Room	Lounge	Bar	Italian Restaurant	Waterfront	Bridge	Japanese Restaurant	Theater
96	Cashew	Bus Station	Food Court	Boarding House	Basketball Court	Park	Seafood Restaurant	Yunnan Restaurant	Flower Shop	Food	Food Service

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
99	King Albert Park	Bus Station	Convenience Store	Trail	Indian Restaurant	Historic Site	Gym / Fitness Center	Gym	Gourmet Shop	Gas Station	Food Court
100	Sixth Avenue	Indian Restaurant	Bakery	Wine Bar	BBQ Joint	Food Court	Coffee Shop	Building	Spa	Pizza Place	Seafood Restaurant
103	Rochor	Indian Restaurant	Vegetarian / Vegan Restaurant	Café	Japanese Restaurant	Hostel	Chinese Restaurant	Art Gallery	Shopping Plaza	Shopping Mall	Clothing Store
106	Fort Canning	Japanese Restaurant	Hotel	Bar	Nightclub	Bakery	Spa	Café	Pub	Mexican Restaurant	Lounge
107	Bencoolen	Café	Hotel	Japanese Restaurant	Art Gallery	Restaurant	History Museum	Bakery	Bookstore	Sushi Restaurant	Movie Theater
108	Jalan Besar	Indian Restaurant	Chinese Restaurant	Hotel	Café	Hostel	Vegetarian / Vegan Restaurant	Bakery	Asian Restaurant	Food Court	Noodle House
109	Bendemeer	Hostel	BBQ Joint	Vegetarian / Vegan Restaurant	Restaurant	Asian Restaurant	Bar	Coffee Shop	Supermarket	Café	Vietnamese Restaurant
115	Bedok Reservoir	Asian Restaurant	Supermarket	Food Court	Bus Stop	Bus Line	Park	Noodle House	Fujian Restaurant	Furniture / Home Store	Fruit & Vegetable Store

```
In [48]:   #Examine the clusters - cluster 6
           station_merged.loc[station_merged['Cluster Labels'] == 5, station_merged.columns[[0] + list(range(5, station_merged.shape[1]))]]
```

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
2	Bukit Gombak	Food Court	Convenience Store	Stadium	Vegetarian / Vegan Restaurant	Steakhouse	Supermarket	Flea Market	Chinese Restaurant	Fast Food Restaurant	Malay Restaurant
3	Choa Chu Kang	Coffee Shop	Fast Food Restaurant	Italian Restaurant	Bubble Tea Shop	Food Court	Supermarket	Sushi Restaurant	Shop & Service	Metro Station	Thai Restaurant
6	Marsiling	Food Court	Grocery Store	Steakhouse	Fast Food Restaurant	Japanese Restaurant	Bus Station	Asian Restaurant	Track	Hainan Restaurant	Trail
8	Admiralty	Supermarket	Food Truck	Snack Place	Park	Bus Station	Food Court	Asian Restaurant	Coffee Shop	Flea Market	Flower Shop
9	Sembawang	Coffee Shop	Convenience Store	Electronics Store	Asian Restaurant	Supermarket	Fast Food Restaurant	Bus Station	Japanese Restaurant	Bistro	Shopping Mall
11	Khatib	Coffee Shop	Bus Stop	Supermarket	Asian Restaurant	Bakery	Park	Train Station	Café	Skate Park	Shopping Mall
29	Gul Circle	Park	Train Station	Electronics Store	Coffee Shop	Yunnan Restaurant	Filipino Restaurant	Flea Market	Flower Shop	Food	Food Court
33	Lakeside	Coffee Shop	Convenience Store	Trail	Pool	Snack Place	Food Court	Yunnan Restaurant	Fish & Chips Shop	Flea Market	Flower Shop
36	Dover	Fast Food Restaurant	Sandwich Place	College Cafeteria	Coffee Shop	Filipino Restaurant	Fish & Chips Shop	Flea Market	Flower Shop	Food	Food Court
55	Pasir Ris	Food Court	Fast Food Restaurant	Convenience Store	Pharmacy	Sandwich Place	Coffee Shop	Diner	Sushi Restaurant	Italian Restaurant	Park
69	Buangkok	Fast Food Restaurant	Metro Station	Wings Joint	Convenience Store	Trail	Pharmacy	Food Court	Food Service	Fish & Chips Shop	Flea Market
90	Haw Par Villa	Theme Park	Metro Station	Sculpture Garden	Office	Miscellaneous Shop	Korean Restaurant	Asian Restaurant	Food Court	Coffee Shop	Food Service
110	Geylang Bahru	Coffee Shop	Department Store	Indian Restaurant	Supermarket	Pool	Food Court	Café	Yunnan Restaurant	Flea Market	Flower Shop
111	Mattar	Food Court	Coffee Shop	Vegetarian / Vegan Restaurant	Bus Station	Gas Station	Asian Restaurant	Bistro	Park	Canal	Soccer Field

	station_name	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
113	Kaki Bukit	Food Court	Coffee Shop	Baby Store	Skate Park	Kids Store	Convenience Store	Asian Restaurant	Motorcycle Shop	Boutique	Yunnan Restaurant
118	Upper Changi	Convenience Store	Metro Station	Bus Station	Gym	Pool	Lake	Grocery Store	Asian Restaurant	Cafeteria	Coffee Shop

In [49]:
```python
#group by station and find number of venue category of each type
stn_grp = station_venues.groupby(['Station', 'Venue_Category']).size()
stn_grp
```

```
Out[49]:  Station      Venue_Category
          Admiralty    Asian Restaurant               1
                       Bus Station                    1
                       Coffee Shop                    1
                       Food Court                     1
                       Food Truck                     1
                       Park                           1
                       Snack Place                    1
                       Supermarket                    2
          Aljunied     Asian Restaurant               4
                       BBQ Joint                      1
                       Badminton Court                1
                       Basketball Court               1
                       Boarding House                 1
                       Breakfast Spot                 1
                       Bus Station                    2
                       Café                           1
                       Chinese Restaurant             8
                       Coffee Shop                    2
                       Convenience Store              1
                       Cosmetics Shop                 1
                       Dim Sum Restaurant             2
                       Farmers Market                 1
                       Food Court                     2
                       Food Truck                     1
                       Indian Restaurant              1
                       Japanese Restaurant            1
                       Kitchen Supply Store           1
                       Martial Arts Dojo              1
                       Nightclub                      1
                       Noodle House                   6
                                                     ..
          Yishun       Tea Room                       1
                       Thai Restaurant                1
                       Vegetarian / Vegan Restaurant  1
                       Video Game Store               1
          one-north    Asian Restaurant               1
                       Beer Bar                       1
                       Beer Garden                    1
                       Breakfast Spot                 1
                       Bubble Tea Shop                1
                       Bus Station                    2
                       Café                           6
                       Coffee Shop                    4
                       Convenience Store              1
                       Dessert Shop                   1
                       Filipino Restaurant            1
                       Food Court                     2
                       Fried Chicken Joint            1
```

```
        Gym / Fitness Center         1
        Indian Restaurant            1
        Italian Restaurant           2
        Japanese Restaurant          1
        Korean Restaurant            1
        Middle Eastern Restaurant    1
        Noodle House                 2
        Pool                         1
        Salad Place                  2
        Sandwich Place               2
        Soup Place                   1
        Supermarket                  1
        Thai Restaurant              1
Length: 2995, dtype: int64
```

In [50]: ```python
#find station with max number of venue category
stn_grp.idxmax()
```

Out[50]: ('Jalan Besar', 'Indian Restaurant')

```
In [51]:   # which indian restaurants
           station_venues.query('Station == ["Jalan Besar"] and Venue_Category == ["Indian Restaurant"]')
```

Out[51]:

	Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude	Venue_Category
4459	Jalan Besar	1.305551	103.855443	Bismillah Biryani	1.304956	103.853602	Indian Restaurant
4465	Jalan Besar	1.305551	103.855443	Murugan Idli Shop	1.308842	103.856380	Indian Restaurant
4472	Jalan Besar	1.305551	103.855443	Azmi Restaurant	1.308256	103.853075	Indian Restaurant
4473	Jalan Besar	1.305551	103.855443	Sakunthala's Restaurant	1.306000	103.852169	Indian Restaurant
4479	Jalan Besar	1.305551	103.855443	Komala Vilas (Buffalo Rd)	1.306308	103.851158	Indian Restaurant
4482	Jalan Besar	1.305551	103.855443	Khansama Tandoori Restaurant	1.308251	103.853122	Indian Restaurant
4492	Jalan Besar	1.305551	103.855443	Kailash Parbat	1.308039	103.852660	Indian Restaurant
4493	Jalan Besar	1.305551	103.855443	Lagnaa Barefoot Dining	1.306472	103.852298	Indian Restaurant
4501	Jalan Besar	1.305551	103.855443	Veeras Curry Restaurant @ Hindoo Rd	1.308650	103.853515	Indian Restaurant
4505	Jalan Besar	1.305551	103.855443	Sakunthala's Restaurant	1.309475	103.855717	Indian Restaurant
4512	Jalan Besar	1.305551	103.855443	Premaas Cuisine	1.305094	103.851980	Indian Restaurant
4522	Jalan Besar	1.305551	103.855443	Taste Of India	1.307900	103.852089	Indian Restaurant
4525	Jalan Besar	1.305551	103.855443	The Banana Leaf Apolo	1.305348	103.851698	Indian Restaurant
4527	Jalan Besar	1.305551	103.855443	Islamic Restaurant	1.303075	103.859172	Indian Restaurant
4529	Jalan Besar	1.305551	103.855443	Kebabs 'n Curries	1.309157	103.856456	Indian Restaurant
4532	Jalan Besar	1.305551	103.855443	Allauddin's Briyani	1.305799	103.851180	Indian Restaurant
4533	Jalan Besar	1.305551	103.855443	Ma Raj Restaurant	1.309817	103.855970	Indian Restaurant
4535	Jalan Besar	1.305551	103.855443	Saravanaa Bhavan	1.309272	103.855971	Indian Restaurant
4537	Jalan Besar	1.305551	103.855443	Copper Chimney	1.309712	103.855447	Indian Restaurant
4541	Jalan Besar	1.305551	103.855443	Ananda Bhavan Restaurant	1.309665	103.855614	Indian Restaurant
4546	Jalan Besar	1.305551	103.855443	Yakader	1.305794	103.851108	Indian Restaurant

```
In [52]: A = stn_grp.to_frame() # convert series object to dataframe for further analysis
         A['Counts'] = A.iloc[:,-1] #rename counts as Counts column
         A.head()
         A=A.drop([A.columns[-2]], axis = 'columns') # remove duplicate count column
         A.head()
```

Out[52]:

		Counts
Station	**Venue_Category**	
Admiralty	Asian Restaurant	1
	Bus Station	1
	Coffee Shop	1
	Food Court	1
	Food Truck	1

```
In [53]: Alist = A.groupby('Venue_Category')['Counts'].sum() #Sum up number for each venue category
         Alist
```

```
Out[53]: Venue_Category
         ATM                              1
         Accessories Store                4
         Airport                          2
         Airport Lounge                   5
         American Restaurant             22
         Arcade                           4
         Art Gallery                     21
         Art Museum                       2
         Arts & Crafts Store              8
         Asian Restaurant               122
         Athletics & Sports               2
         Australian Restaurant            5
         BBQ Joint                       42
         Baby Store                       1
         Badminton Court                  1
         Bagel Shop                       2
         Bakery                         120
         Bank                             2
         Bar                             43
         Basketball Court                 7
         Bay                              1
         Bed & Breakfast                  5
         Beer Bar                        16
         Beer Garden                      8
         Beer Store                       1
         Betting Shop                     1
         Bike Rental / Bike Share         2
         Bistro                          20
         Board Shop                       1
         Boarding House                   2
                                        ...
         Tea Room                        15
         Tech Startup                     1
         Temple                           1
         Tennis Court                     3
         Thai Restaurant                 56
         Theater                          9
         Theme Park                       1
         Theme Park Ride / Attraction     2
         Theme Restaurant                 1
         Thrift / Vintage Store           3
         Toy / Game Store                 8
         Track                            2
         Trail                           12
         Train Station                   14
         Travel Lounge                    1
         Vegetarian / Vegan Restaurant   57
         Video Game Store                 3
```

```
        Video Store                       1
        Vietnamese Restaurant           17
        Warehouse Store                  1
        Water Park                       1
        Waterfall                        1
        Waterfront                      10
        Whisky Bar                       8
        Wine Bar                        23
        Wine Shop                        1
        Wings Joint                     10
        Women's Store                    4
        Yoga Studio                     21
        Yunnan Restaurant                1
        Name: Counts, Length: 320, dtype: int64
```

In [54]:
```python
Alist.sort_values(ascending = False, inplace = True) #sort venue category in descending order
Top_10 = Alist.head(10) #find top 10 venue category
Top_10
```

Out[54]:
```
        Venue_Category
        Coffee Shop            237
        Chinese Restaurant     237
        Café                   227
        Japanese Restaurant    181
        Food Court             179
        Hotel                  133
        Asian Restaurant       122
        Bakery                 120
        Indian Restaurant      114
        Fast Food Restaurant    99
        Name: Counts, dtype: int64
```

In [55]:
```python
# plot Bar graph
import matplotlib as mpl
import matplotlib.pyplot as plt

Top_10.plot(kind = 'bar')

plt.title('Top Ten Venue Category in MRT and LRT Stations')
plt.xlabel('Venue Category')
plt.ylabel('Number')
plt.show()
```
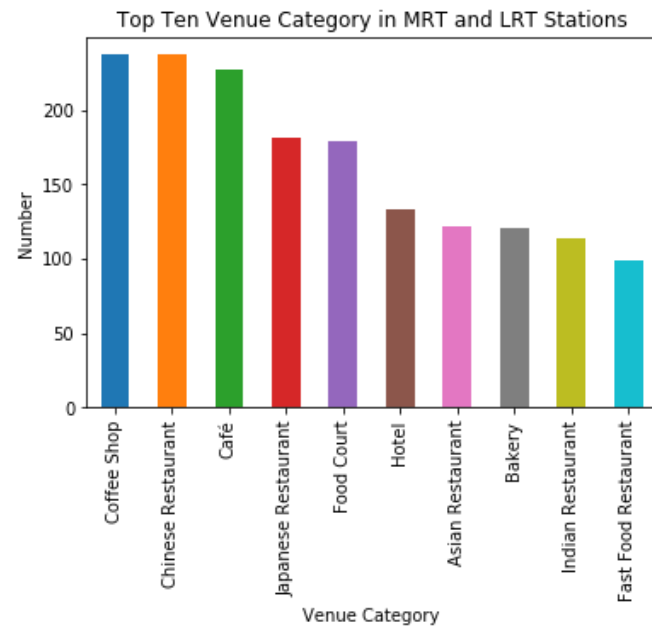
```python
In [56]:  #group by station and find number of venue of each type
          stn_grp2 = station_venues.groupby(['Station', 'Venue']).size()
          stn_grp2
```

```
Out[56]: Station      Venue
         Admiralty   Ajmir Store Pte Ltd                              1
                     Bus Stop 46789                                   1
                     Circle Green Park                                1
                     Kampung Admiralty Hawker Centre                  1
                     Mr Bean                                          1
                     NTUC FairPrice                                   1
                     NTUC Fairprice                                   1
                     Starbucks                                        1
                     家传小吃                                                1
         Aljunied    7-Eleven                                         1
                     Aikido Shinju-kai (Singapore) HQ 心柔会本部道场             1
                     Aljunied MRT Station (EW9)                       1
                     Builders At Sims                                 1
                     Bus Stop 80231 (Blk 59)                          1
                     Bus Stop 80239 (opp Blk 59)                      1
                     Ci Hang Western & Chinese Vegetarian Fast Food   1
                     Collin's Grille . Bento                          1
                     Durians @ Lorong 21 Geylang                      1
                     Eastern House Of Seafood Delicacy                1
                     GMS Indoor Basketball Court                      1
                     Geylang East Sin Hin Food Centre                 1
                     He Ping Claypot Rice Restaurant                  1
                     Hock Heng Cooked Food                            1
                     Hokee Pau (和记包）                                    1
                     Hollywood Duck Rice • Duck Porridge              1
                     Hong Qin Fish & Duck Porridge                    1
                     J&M Essentials & Toiletries                      1
                     J.B. Ah Meng Restaurant                          1
                     Junction Food Place                              1
                     Kim Kee Prawn Noodles 金记肉骨虾面                        1
                                                                     ..
         one-north   Da Paolo Bistro Bar                              1
                     Dutch Colony Coffee Co.                          1
                     Each A Cup                                       1
                     Fishball Story                                   1
                     Fitness First                                    1
                     Grand Salads Bistro                              1
                     Hoodadak                                         1
                     Huggs                                            1
                     Hungrywich's                                     1
                     Iskina Cebu                                      1
                     Jimmy Monkey Cafe & Bar                          1
                     Jvc Food Centre                                  1
                     Kick Cafe @ Block 69                             1
                     Mr Bean                                          1
                     One Man Coffee @ Kinesis                         1
                     Quickpick Minimart                               1
                     Ristorante Pietrasanta                           1
```

```
              Rong Hua Bak Kut Teh                       1
              SaladStop!                                 1
              Shin Nichi Japanese Restaurant             1
              Starbucks                                  2
              Subway                                     1
              Swimming Pool                              1
              T-Zone @ Fairfield Methodist Secondary     1
              The Red Noodle & Bottle Bar                1
              The Soup Spoon                             1
              Tuckshop                                   1
              Two Wings                                  1
              Wong Kee Wanton Noodles & Roasted Delights 1
              timbre+                                    1
       Length: 4631, dtype: int64
```

In [57]: `stn_grp2.idxmax() #Find venue with max number and the corresponding station`

Out[57]: `('Downtown', 'Starbucks')`

In [58]:
```
#detailed analysis on Downtown Starbucks -get new df containing all Starbucks outlets at Downtown Station
Downtown_df = station_venues.loc[(station_venues['Station']=='Downtown') & (station_venues['Venue']=='Starbucks'),['Station', 'Station_Latitu
de', 'Station_Longitude','Venue','Venue_Latitude', 'Venue_Longitude' ]]
Downtown_df
```

Out[58]:

	Station	Station_Latitude	Station_Longitude	Venue	Venue_Latitude	Venue_Longitude
4080	Downtown	1.27949	103.852802	Starbucks	1.279335	103.854128
4112	Downtown	1.27949	103.852802	Starbucks	1.277949	103.850985
4131	Downtown	1.27949	103.852802	Starbucks	1.276988	103.852458
4146	Downtown	1.27949	103.852802	Starbucks	1.279422	103.854494

In [59]:
```python
#Plot locations of these Starbucks
#display map with locations of subway
#get downtown latitude, longitude

d_latitude = 1.27949 # station latitude value
d_longitude = 103.852802 # station longitude value

#display map centered on downtown station
downtown_map = folium.Map(location=[d_latitude, d_longitude], zoom_start=17)

#add circle marker on Admiralty station
folium.features.CircleMarker(
    [d_latitude, d_longitude],
    radius=10,
    popup='Downtown',
    fill=True,
    color='red',
    fill_color='red',
    fill_opacity=0.6
    ).add_to(downtown_map)

for lat, lng, label in zip(Downtown_df.Venue_Latitude, Downtown_df.Venue_Longitude, Downtown_df.Venue):
    folium.features.CircleMarker(
    [lat, lng],
    radius=5,
    popup=label,
    fill=True,
    color='blue',
    fill_color='blue',
    fill_opacity=0.6
    ).add_to(downtown_map)

# display map
downtown_map
```

Out[59]:

```
In [60]: #find atm locations
         ATM_df = station_venues.loc[(station_venues['Venue_Category']=='ATM'),['Station', 'Station_Latitude', 'Station_Longitude','Venue_Category',
         'Venue','Venue_Latitude', 'Venue_Longitude' ]]
         ATM_df
```

Out[60]:

	Station	Station_Latitude	Station_Longitude	Venue_Category	Venue	Venue_Latitude	Venue_Longitude
2942	Punggol	1.405191	103.902367	ATM	POSB AutoLobby	1.405983	103.901544

```
In [ ]: #End
```