## **Segmenting and Clustering Neighbourhoods in Toronto**- Part 3

```
In [1]:
pip install geopy
Requirement already satisfied: geopy in ./anaconda3/lib/python3.8/site-packag
es (2.1.0)
Requirement already satisfied: geographiclib<2,>=1.49 in ./anaconda3/lib/pyth
on3.8/site-packages (from geopy) (1.50)
Note: you may need to restart the kernel to use updated packages.
                                                                       In [2]:
pip install folium
Requirement already satisfied: folium in ./anaconda3/lib/python3.8/site-packa
ges (0.12.0)
Requirement already satisfied: jinja2>=2.9 in ./anaconda3/lib/python3.8/site-
packages (from folium) (2.11.2)
Requirement already satisfied: branca>=0.3.0 in ./anaconda3/lib/python3.8/sit
e-packages (from folium) (0.4.2)
Requirement already satisfied: requests in ./anaconda3/lib/python3.8/site-pac
kages (from folium) (2.24.0)
Requirement already satisfied: numpy in ./anaconda3/lib/python3.8/site-packag
es (from folium) (1.18.5)
Requirement already satisfied: MarkupSafe>=0.23 in ./anaconda3/lib/python3.8/
site-packages (from jinja2>=2.9->folium) (1.1.1)
Requirement already satisfied: certifi>=2017.4.17 in ./anaconda3/lib/python3.
8/site-packages (from requests->folium) (2020.6.20)
Requirement already satisfied: idna<3,>=2.5 in ./anaconda3/lib/python3.8/site
-packages (from requests->folium) (2.10)
Requirement already satisfied: urllib3!=1.25.0, !=1.25.1, <1.26, >=1.21.1 in ./a
naconda3/lib/python3.8/site-packages (from requests->folium) (1.25.9)
Requirement already satisfied: chardet<4,>=3.0.2 in ./anaconda3/lib/python3.8
/site-packages (from requests->folium) (3.0.4)
Note: you may need to restart the kernel to use updated packages.
                                                                       In [3]:
import folium
import requests
import json
import matplotlib.cm as cm
import matplotlib.colors as colors
import pandas as pd
from pandas.io.json import json normalize
from sklearn.cluster import KMeans
```

P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
M 1 A \ n	N o t a s s i g n e d \ n	N o t a s s i g n e d \ n	4 3 6 4 8 6 9	- 7 9 3 8 5 4 4

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
1	M 1 B \ n	S c a r b o r o u g h \ n	M a l v e r n , R o u g e	4 3 8 1 1 3 9	7 9 1 9 6 6 2
2	M 1 C \	S c a r b o r o u g h	R o u g e H i l r v o r t U n	4 3 7 8 5 7 4	- 7 9 1 5 8 7 5

	P o s t a l c o d	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d
			i o n , H i g h l a n d C r e e k		
3	M 1 E \ n	S c a r b o r o u g h	G u i l d w o o d M	4 3 7 6 5 7 5	- 7 9 1 7 4 7

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
		n	r n i n g s i d e , W e s t H i		
4	M 1 G \ n	S c a r b o r o u g h	W o b u r	4 3 7 6 8 1 2	- 7 9 2 1 7 6

P o s t a l c o d e	B o r o u g h	N e i g h b o r h o d	L a t i t u d e	L o n g i t u d e
	\ n			

address = 'Toronto, Ontario Canada' geolocator = Nominatim(user agent="http") location = geolocator.geocode(address) latitude = location.latitude longitude = location.longitude print('The geograpical coordinate of Toronto Canada are {}, {}.'.format(latit ude, longitude)) The geograpical coordinate of Toronto Canada are 43.6534817, -79.3839347. In [11]: map toronto = folium.Map(location=[latitude, longitude], zoom start=11) for lat, lng, borough, neighborhood in zip(df['Latitude'], df['Longitude'], d f['Borough'], df['Neighborhood']): label = '{}, {}'.format(neighborhood, borough) label = folium.Popup(label, parse html=True) folium.CircleMarker( [lat, lng], radius=4, popup=label, color='blue', fill=True, fill color='#87cefa', fill opacity=0.5, parse\_html=False).add\_to(map\_toronto) map toronto

In [10]:

toronto\_data = df[df['Borough'].str.contains("Toronto")].reset\_index(drop=Tru
e)
print(toronto\_data.shape)
toronto\_data.head()

(39, 5)

Out[12]:

	T	T	T	T	Out[12]:
	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d
0	M 4 E \ n	E a s t T o r o n t o	T h e B e a c h e	4 3 6 7 7 0 9	- 7 9 2 9 5 4 7
1	M 4 K \ n	E a s t T o r	T h e D a n f	4 3 6 8 3	- 7 9 3 5 5

	P o s t a l c o d	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
		n t o \ n	r t h W e s t , R i v e r d a l e	7 5	1 2
2	M 4 L \ n	E a s t T o r o n t	I n d i a B a z a a r	4 3 6 6 7 9 7	7 9 3 1 4 6 7

	P o s t a l c o d	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
		n	T h e B e a c h e s W e s t		
3	M 4 M \ n	E a s t T o r o n t o	S t u d i o D i s t r i c t	4 3 6 6 2 1 3	7 9 3 3 4 9

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d
4	M 4 N \ n	C e n t r a l T o r o n t o n	L a w r e n c e P a r k	4 3 7 2 8 4 3	7 9 3 8 7 1

map\_toronto = folium.Map(location=[latitude, longitude], zoom\_start=11) for lat, lng, label in zip(toronto data['Latitude'], toronto data['Longitude'] 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\_to

In [13]:

Make this Notebook Trusted to load map: File -> Trust Notebook

label = folium.Popup(label, parse\_html=True)

], toronto\_data['Neighborhood']):

ronto)

map\_toronto

Out[13]:

In [14]:

```
# Foursquare API
CLIENT ID = 'DPBYY4JUY3DU20ALPSUV4ONY2K1GOJJKJ1NIHBB32XEMOVYY' # Put Your Cli
ent Id
CLIENT SECRET = '1MV443TYEP4HU00WDUW5NQ5W10L2Y4G05NWG11WIR3NUGC5B' # Put You
Client Secret
VERSION = '20180604'
LIMIT = 30
print('Your credentails:')
print('CLIENT ID: Hidden')
print('CLIENT SECRET: Hidden')
Your credentails:
CLIENT ID: Hidden
CLIENT SECRET: Hidden
1. Exploring Neighbourhood in Toronto
                                                                      In [15]:
def getNearbyVenues(names, latitudes, longitudes, radius=500):
    venues list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)
        url = 'https://api.foursquare.com/v2/venues/explore?&client id={}&cli
ent secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
            CLIENT ID, CLIENT SECRET, VERSION, lat, lng, radius, LIMIT)
        results = requests.get(url).json()["response"]['groups'][0]['items']
        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 = ['Neighborhood', 'Neighborhood Latitude', 'Neighb
orhood Longitude', 'Venue', 'Venue Latitude', 'Venue Longitude', 'Venue Categ
ory']
    return (nearby venues)
                                                                      In [16]:
df = toronto data
toronto venues = getNearbyVenues(names=df['Neighborhood'], latitudes=df['Lati
tude'],longitudes=df['Longitude'])
The Beaches
```

```
The Danforth West, Riverdale
India Bazaar, The Beaches West
Studio District
Lawrence Park
Davisville North
North Toronto West, Lawrence Park
Davisville
Moore Park, Summerhill East
Summerhill West, Rathnelly, South Hill, Forest Hill SE, Deer Park
Rosedale
St. James Town, Cabbagetown
Church and Wellesley
Regent Park, Harbourfront
Garden District, Ryerson
St. James Town
Berczy Park
Central Bay Street
Richmond, Adelaide, King
Harbourfront East, Union Station, Toronto Islands
Toronto Dominion Centre, Design Exchange
Commerce Court, Victoria Hotel
Roselawn
Forest Hill North & West, Forest Hill Road Park
The Annex, North Midtown, Yorkville
University of Toronto, Harbord
Kensington Market, Chinatown, Grange Park
CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst Quay,
South Niagara, Island airport
Stn A PO Boxes
First Canadian Place, Underground city
Christie
Dufferin, Dovercourt Village
Little Portugal, Trinity
Brockton, Parkdale Village, Exhibition Place
High Park, The Junction South
Parkdale, Roncesvalles
Runnymede, Swansea
Queen's Park, Ontario Provincial Government
Business reply mail Processing Centre, South Central Letter Processing Plant
Toronto
                                                                       In [17]:
print(toronto venues.shape)
toronto venues.head()
```

(805, 7)

Out[17]:

N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	N e i g h b o r h o d L o n g i t u d e	V e n u e	Ve n u e I a t i t u d e	V e n u e L o n g i t u	u e C a t e g o r
T h e B e a c h e s	4 3 6 7 7 0 9	- 7 9 2 9 5 4 7	C l e n N a n o r R a v i n e	4 3 6 7 6 8 2 1	- 7 9 2 9 3 9 4 2	r a
T h e B	4 3 6	- 7 9	T h e E	4 3	- 7 9	H e a l

Neighborhood	Neighborhood Latitude	NeighborhoodLongitude	V e n u e	V e n u e I a t i t u d e	V e n u e L o n g i t u d e	v e n u e C a t e g o r
e a c h e s	7 7 0 9	2 9 5 4 7	i g C a r o t N a t u r a l F o o d N a r k	7 8 8 7 9	2 9 7 7 3 4	t h F o o d S t o r e

N e i g h b o r h o o d	N e i g h o r h o o d L a t i t u d e	Neighborhood Longitude	V e n u e	V e n u e I a t i t u d e	V e n u e L o n g i t u d e	u e C a t e g o r
			e t			
T h e B e a c h e s	4 3 6 7 7 0 9	- 7 9 2 9 5 4 7	C r o v e r P u b a n d C r u b	4 3 6 7 9 1 8 1	- 7 9 2 9 7 2 1 5	P u b

N e i g h o r h o o d	N e i g h b o r h o o d L a t i t u d e	Neighborhood Longitude	V e n u e	V e n u e I a t i t u d e	V e n u e L o n g i t u d e	n u e C a t e g o r
T h e B e a c h e s	4 3 6 7 7 0 9	- 7 9 2 9 5 4 7	S e a s p r a y R e s t a u r a n t	4 3 6 7 8 8 8	- 7 9 2 9 8 1 6 7	e s t
T h	4 3	- 7	U p	4	- 7	N e

N e i g h o r h o o d	N e i g h b o r h o o d L a t i t u d e	Neighborhood Longitude	e n u e	V e n u e L a t i t u d e	V e n u e I o n g i t u	e n u e C a t e g o r
e B e a c h e s	6 7 7 0 9	9 2 9 5 4 7	p e r E e a c h e s	6 8 0 5 6 3	9 2 9 2 8 6 9	g h b o r h

Dufferin, Dovercourt Village

Little Portugal, Trinity

Brockton, Parkdale Village, Exhibition Place

High Park, The Junction South

Parkdale, Roncesvalles

Runnymede, Swansea

Queen's Park, Ontario Provincial Government

Business reply mail Processing Centre, South Central Letter Processing Plant Toronto

In [17]:

(805,						 Out[17]:
	N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	Neighborhood Longitude	V e n u e	V e n u e L a t i t u d e	V e n u e C a t e g o r y
	T h e B e a c h e s	4 3 6 7 7 0 9	7 9 2 9 5 4 7	C I e n N a n o r R a v i n e	4 3 6 7 6 8 2	T r a i l

N e i g h b o r h o o d	N e i g h b o r h o d L a t i t u d e	NeighborhoodLongitude	V e n u e	V e n u e L a t i t u d e	V e n u e C a t e g o r y
T h e B e a c h e s	4 3 6 7 7 0 9	7 9 2 9 5 4 7	TheeBigCarrotNaturalFooo	4 3 6 7 8 8 7 9	H e a l t h F o o d S t o r e

N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	N e i ghborhood Longitude	V e n u e	V e n u e L a t i t u d e	V e n u e C a t e g o r y
			d M a r k e t		
T h e B e a c h e s	4 3 6 7 7 0 9	7 9 2 9 5 4 7	C r o v e r P u b a n d C	4 3 6 7 9 1 8 1	P u b

N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	Neighborhood Longitude	V e n u e	V e n u e L a t i t u d e	V e n u e C a t e g o r y
			r u b		
T h e B e a c h e s	4 3 6 7 7 0 9	- 7 9 2 9 5 4 7	S e a s p r a y R e s t a u r a	4 3 6 7 8 8 8	A s i a n R e s t a u r a n t

	N e i g h o r h o o d		N e i ghborhoodLatitude		N e i g h b o r h o d L o n g i t u d e		V e n u e	V e n u e L a t i t u d e	; ; ;	V e n u e C a t e g o r y
	T h e B e a c h e s		4 3 6 7 7 0 9		- 7 9 2 9 5 4 7		n t U p p e r B e a c h e s	4 3 6 8 0 5 6 3		N e i g h b o r h o o d
H i g h P		4		4		4	1	4	4	4

	N e i g h b o r h o o d		N e i ghborhoodLatitude		N e i g h o r h o d L o n g i t u d e		V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
ark, The Junction South										
l n d		1 9		1 9		1 9		1 9	1 9	1 9

	N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	NeighborhoodLongitude	V e n u e	VenueLatitude		V e n u e C a t e g o r y
i aBazaar , TheBeachesWest							

	N e i g h o r h o o d		N e i g h b o r h o o d L a t i t u d e		N e i g h o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e		e r u e	
KensingtonMarket,Chinatow		3 0		30		3 0		3 0		3 0		30

	N e i g h b o r h o o d		N e i ghborhoodLatitude		NeighborhoodLongitude		V e n u e		V e n u e L a t i t u d e			V e n u e C a t e g o r y
n , G r a n g e P a r k												
L a w r e n c e P a		2		2		2		2		2		2

	N e i g h o r h o o d		NeighborhoodLatitude		NeighborhoodLongitude		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
r k											
LittlePortugal ,Trini		3 0		3 0		3 0		3 0		3 0	3 0

		N e i g h o r h o o d		N e i ghborhodLatitude		N e i g h b o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
1	t y							1		1	1	
	MoorePark,SummerhillE		4		4		4		4		4	4

	N e i g h b o r h o o d		N e i g h o r h o d L a t i t u d e		Neighborhood Longitude		V e n u e	t i t		V e n u e C a t e g o r y
a s t							•			
N o r t h T o r o n t o W e s t , L a w		4		4		4		4	4	4

	N e i g h b o r h o o d		N e i g h o r h o d L a t i t u d e		Neighborhood Longitude		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
r e n c e P a r k											
Parkdale, Ronce		3 0		3 0		3 0		3		3 0	3 0

	N e i g h o r h o o d		N e i g h b o r h o o d L a t i t u d e		N e i gh b o r h o o d L o n g i t u d e		V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
s v a l l e s										
Queen's Park, Onta		1 7		1 7		1 7		1 7	1 7	

	N e i g h b o r h o d	N e i ghborhoodLatitude	NeighborhoodLongitude	V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
ri o P r o v i n c i a l G o v e r n m e n t							

	N e i g h o r h o o d		N e i g h o r h o d L a t i t u d e		N e i g h b o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
R e gent Park , Harbourf ront		2 1		2 1		2 1		2 1		2 1	2 1

	N e i g h b o r h o o d		N e i g h b o r h o o d L a t i t u d e		N e i g h b o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
Richmond, Adelaide, King		3 0		3 0		3 0		3 0		3 0	3 0

	N e i g h b o r h o o d		N e i g h b o r h o o d L a t i t u d e		N e i g h b o r h o o d L o n g i t u d e		V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
R o s e d a l e		4		4		4	4	ŀ	4	4
R o s e l a w n		1		1		1	,		1	1
R u n		3 0		3 0		3	(	3	3 0	3 0

	N e i g h o r h o o d		N e i ghborhodLatitude		N e i gh b o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e		6 1 1 2 1 6 2 1 8	
y m e d e , S w a n s e a									,	,		
S t . J a m e s T o		3		3 0		3 0		3		3 0		3 0

	N e i g h b o r h o o d		N e i g h o r h o d L a t i t u d e		N e i g h o r h o d L o n g i t u d e		V e n u e		VenueLatitude		V e n u e C a t e g o r y
w n									<u> </u>	l	
St . JamesTown , Cabbaget		3 0		3 0		3 0		3 0		3 0	3 0

	N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e		N e i g h b o r h o d L o n g i t u d e		V e n u e	V e n u e L a t i t u d		V e n u e C a t e g o r y
o w n									
S t n A P O B o x e s	3		3 0		3 0		3	3 0	3 0
S t u d i o D	3		3 0		3 0		3	3 0	3 0

	N e i g h b o r h o o d		N e i g h o r h o d L a t i t u d e		NeighborhoodLongitude		V e n u e		V e n u e L a t i t u d e		v e n u e C a t e g o r	
i s t r i c												
S u m m e r h i I W e s t , R		6		6		6		6		6		6

	N e i g h b o r h o o d	N e i ghborhod Latitud e	N e i g h b o r h o d L o n g i t u d e	V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
a t h n e l l y , S o u t h H i l l , F o r e s t H							

	N e i g h b o r h o o d		N e i g h b o r h o o d L a t i t u d e		N e i g h b o r h o o d L o n g i t u d e		V e n u e		V e n u e L a t i t u d e	V e n u e C a t e g o r y
i I SE , De e r P a r k			,							
T h e A n n e x		2 2		2 2		2 2		2 2	2 2	2 2

	N e i ghborhood	N e i g h o r h o d L a t i t u d e	NeighborhoodLongitude	V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
North Midtown, York ville							

	N e i g h o r h o o d		N e i ghborhood L a t i t u d e		NeighborhoodLongitude		V e n u e		V e n u e L a t i t u d e		V e n u e C a t e g o r y
TheBeaches		5		5		5		5		5	5
T h e D a n f o r t h W		8		8		8		8		8	8

	N e i g h o r h o o d		N e i g h b o r h o o d L a t i t u d e		NeighborhoodLongitude		V e n u e		V e n u e L a t i t u d e		v e n u e C a t e g o r	
est, Riverdale												
T o r o n t o D o m		3		3 0		3		3		3 0		3 0

	N e i g h b o r h o o d	N e i g h b o r h o o d L a t i t u d e	NeighborhoodLongitude	V e n u e	V e n u e L a t i t u d e		V e n u e C a t e g o r y
i n i o n C e n t r e , D e s i g n E x c h a n							

	N e i g h o r h o o d	N e i g h b o r h o o d L a t i t u d e	N e i g h b o r h o o d L o n g i t u d e	V e n u e	Venue Lati tude	; ; ;		V e n u e C a t e g o r y
g e							T = 110	

In [19]:

```
print('There are {} uniques categories.'.format(len(toronto_venues['Venue Cat
egory'].unique())))
```

There are 177 uniques categories.

## 2. Analyze Each Borough Neighborhood

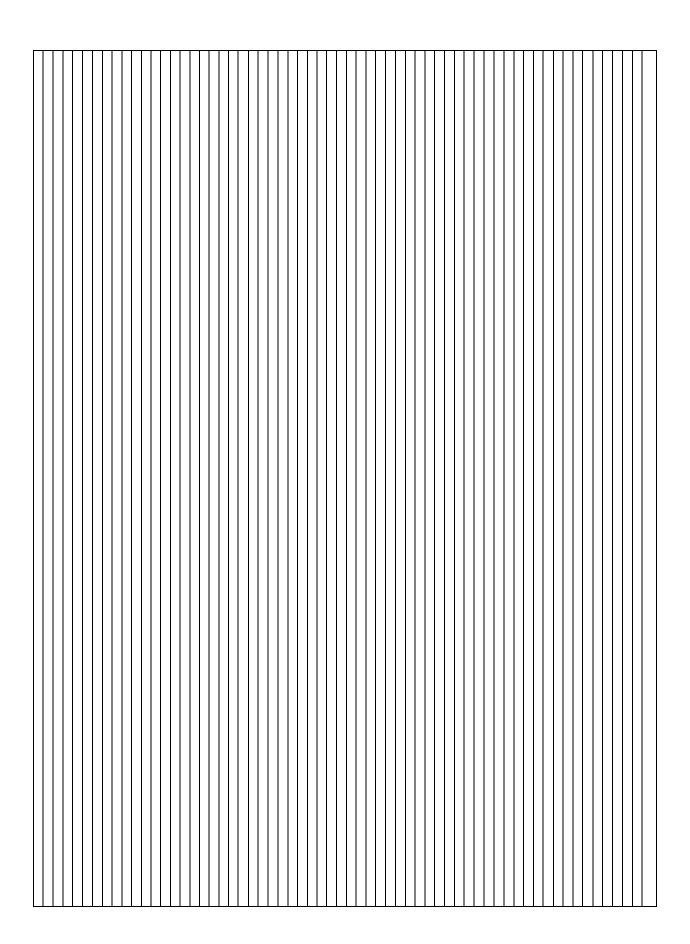
```
In [20]:
toronto_onehot = pd.get_dummies(toronto_venues[['Venue Category']], prefix=""
, prefix_sep="")

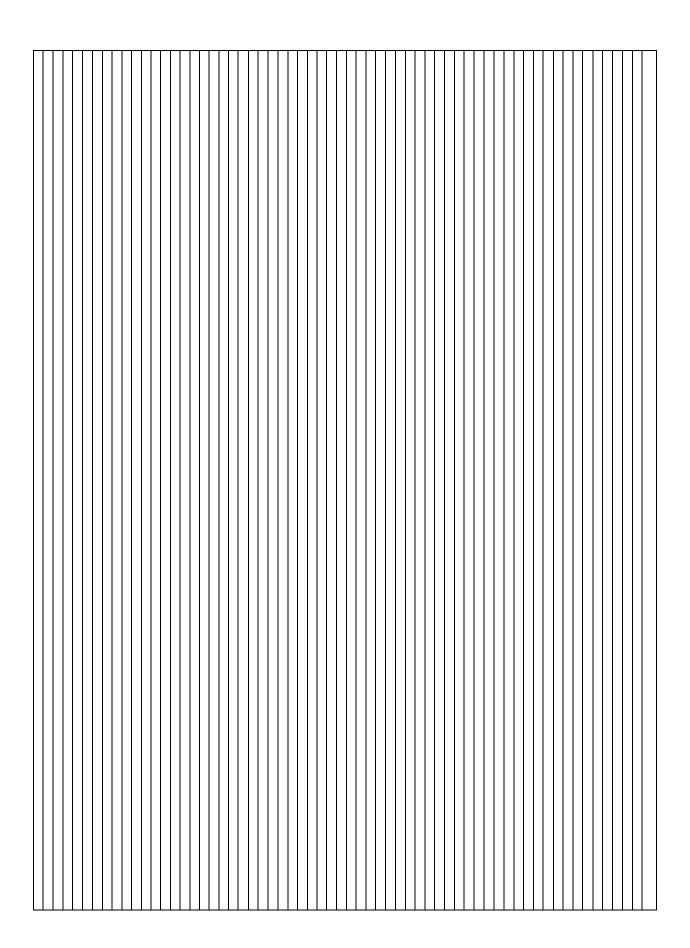
toronto_onehot['Neighborhood'] = toronto_venues['Neighborhood']

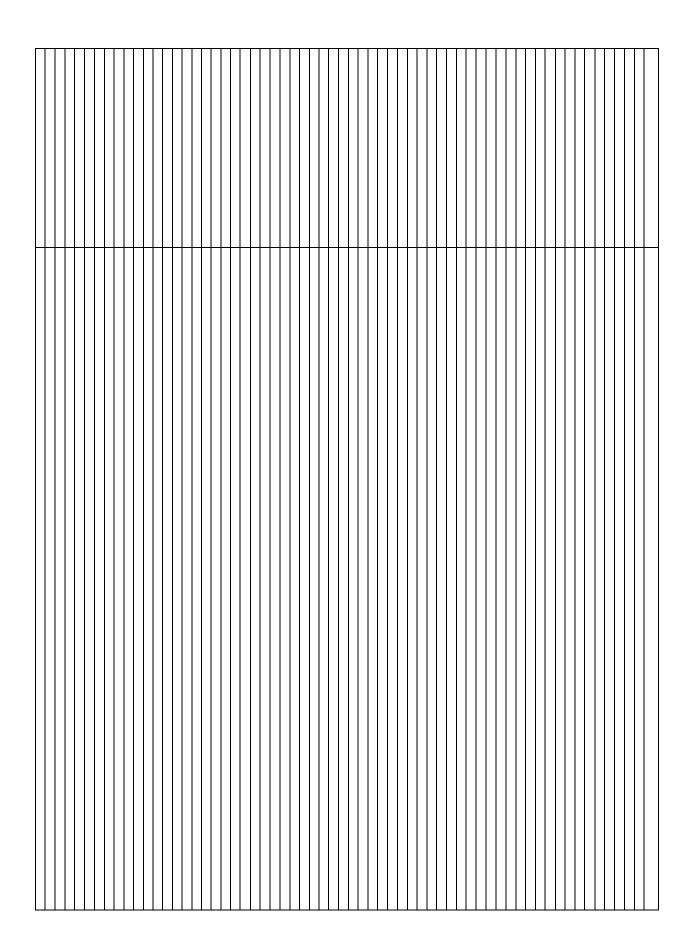
fixed_columns = [toronto_onehot.columns[-1]] + list(toronto_onehot.columns[:-1])
toronto_onehot = toronto_onehot[fixed_columns]

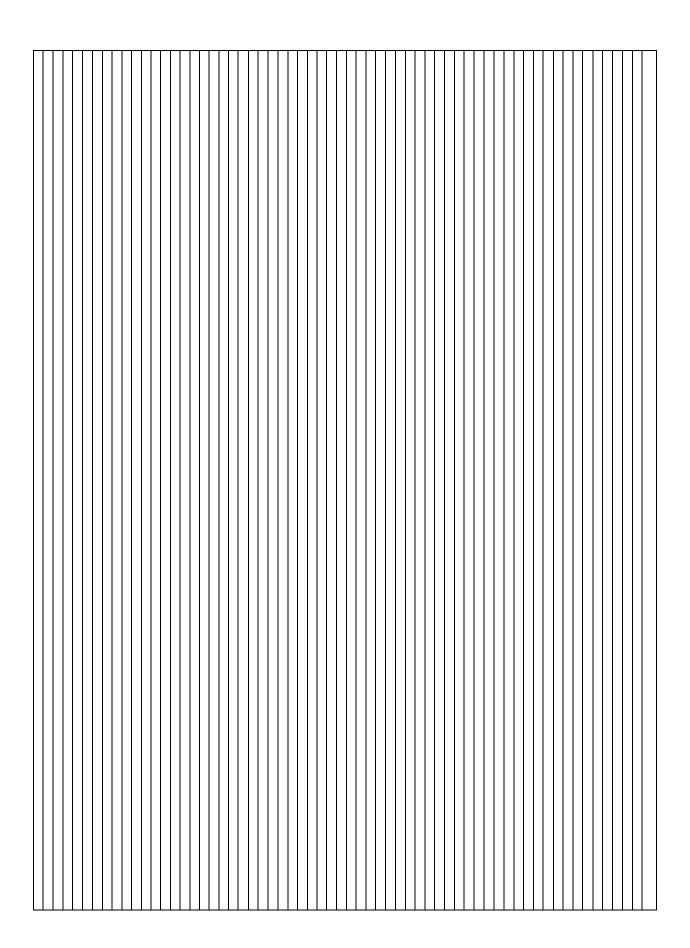
toronto_onehot.head()

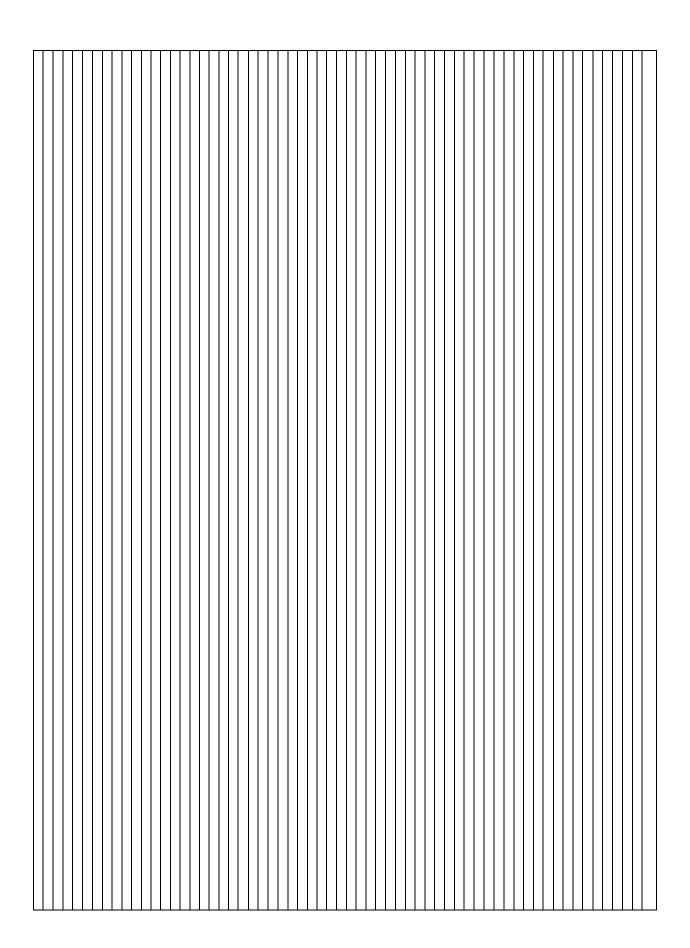
Out[20]:
```

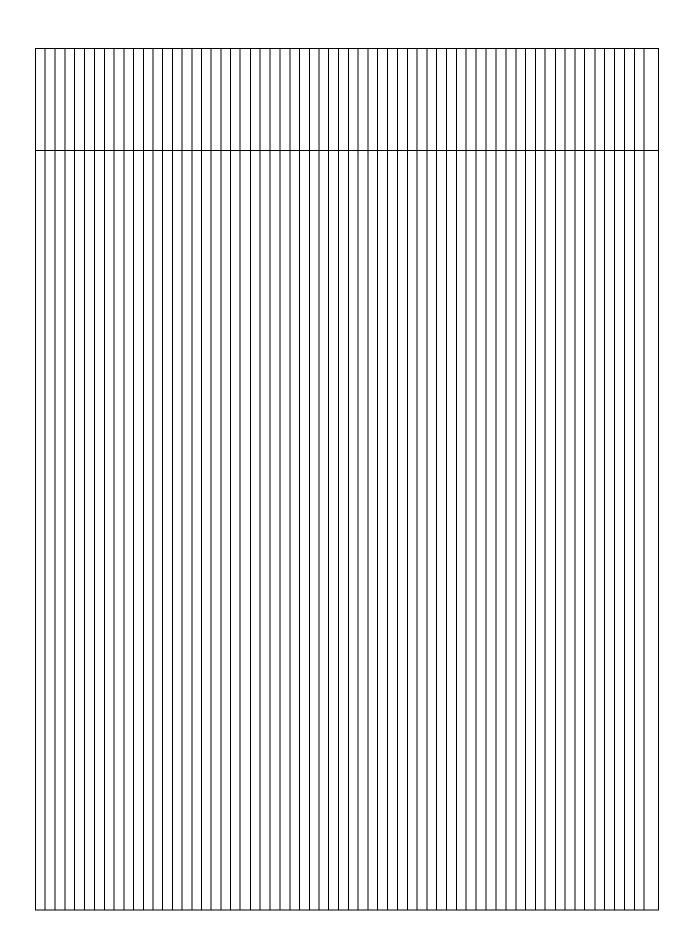


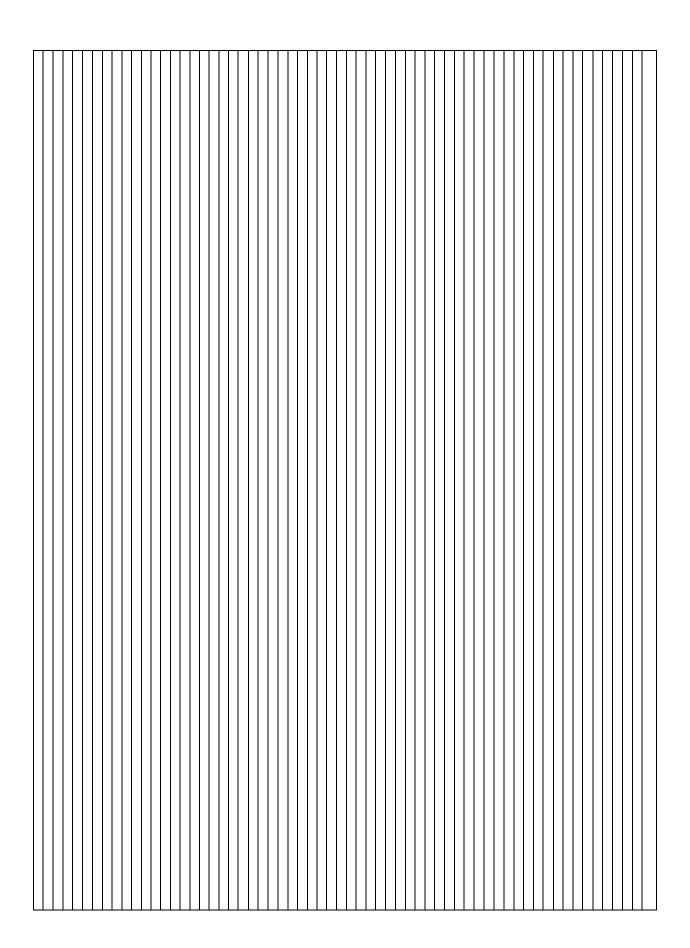


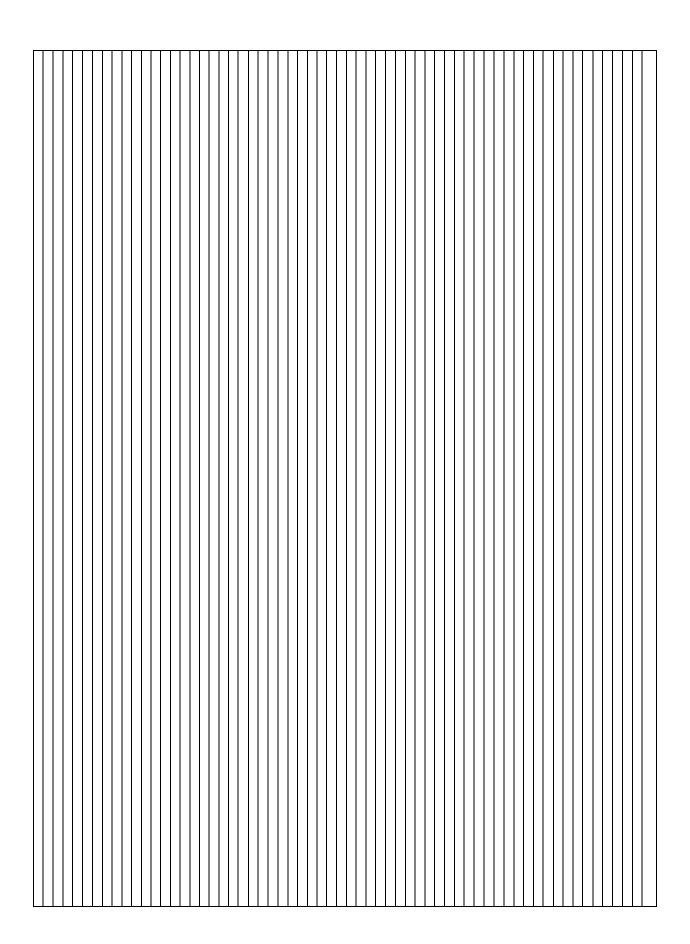


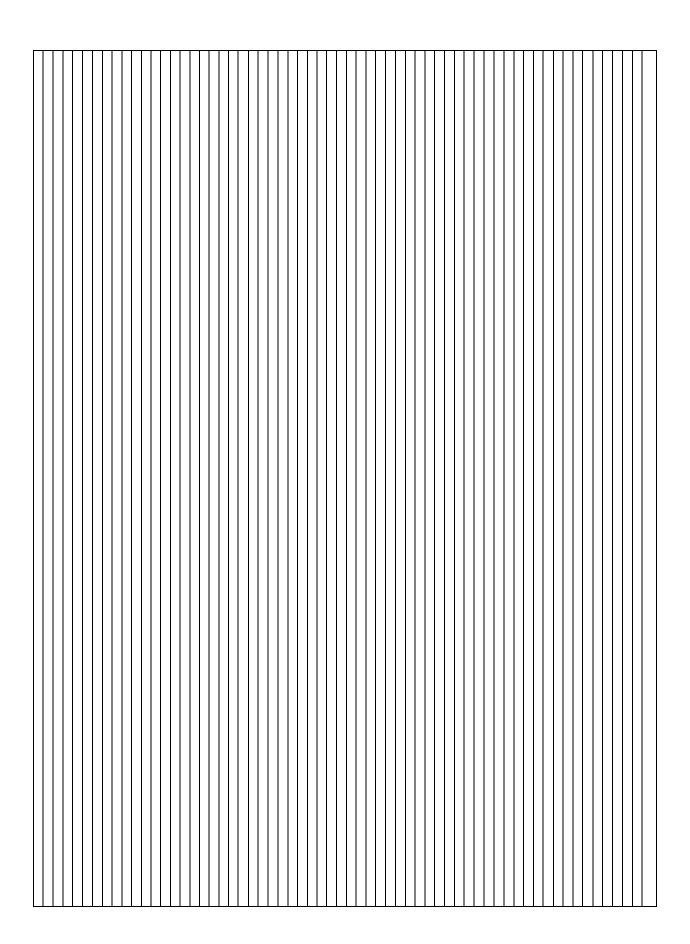


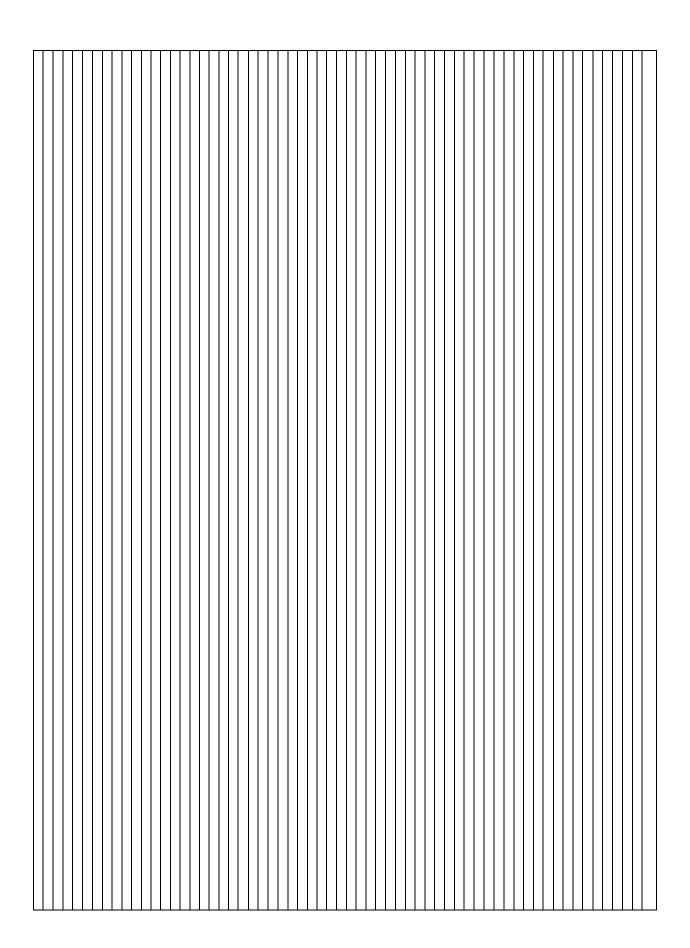


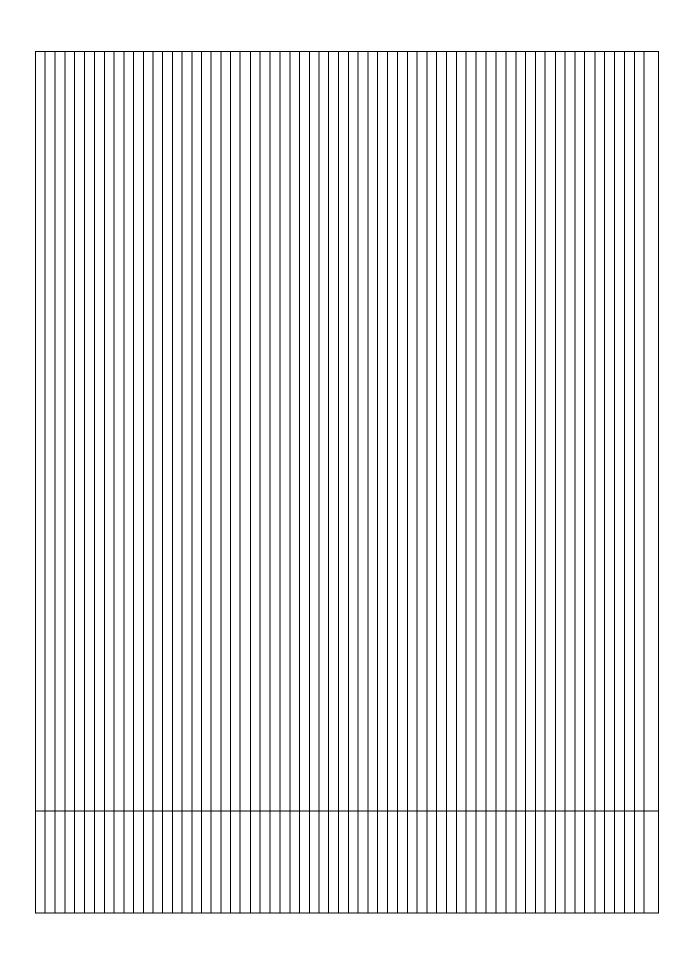


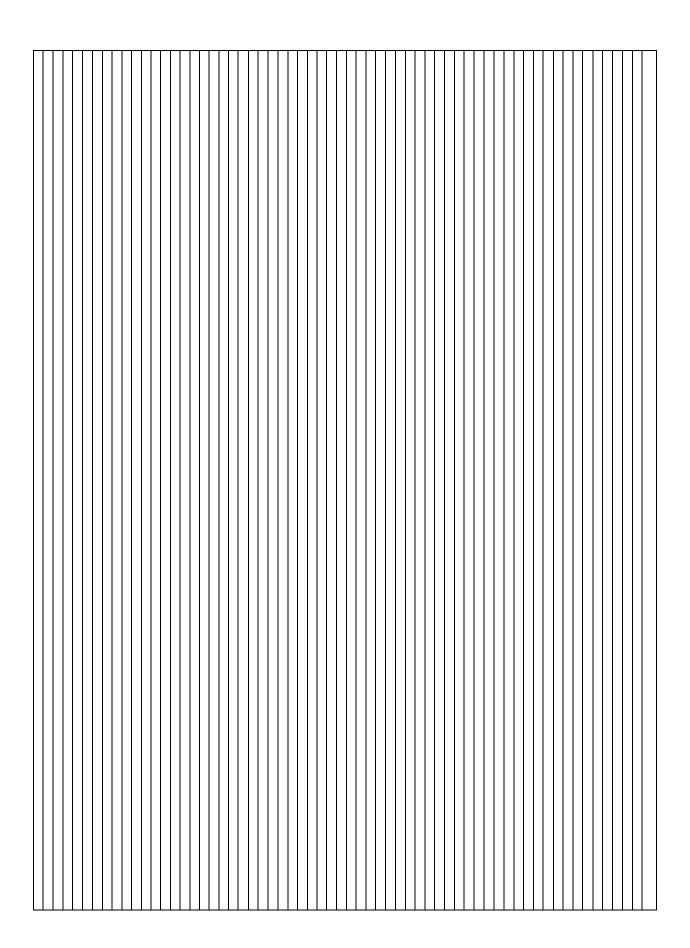


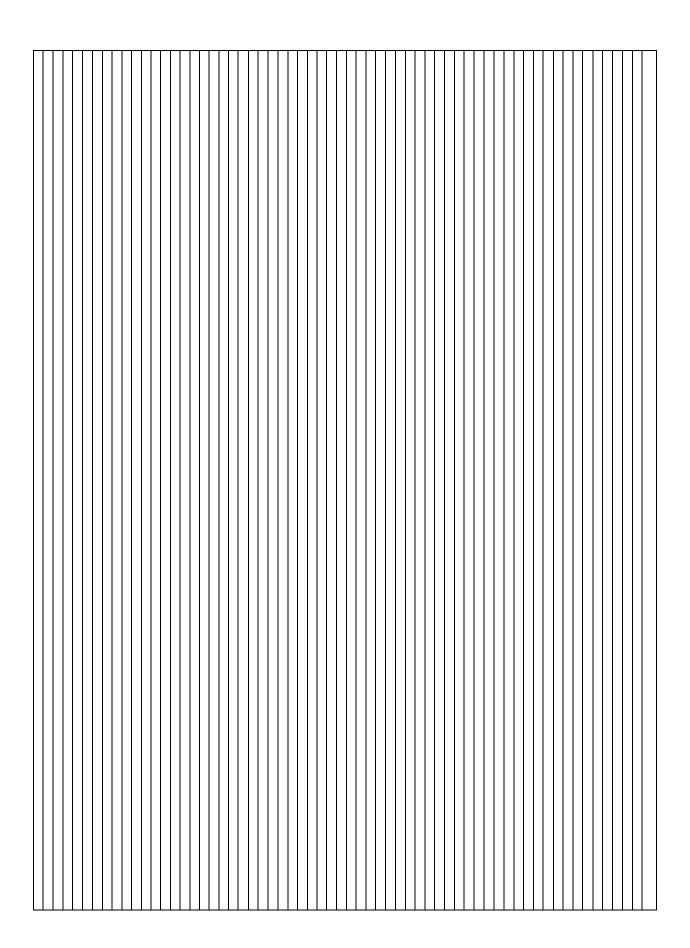


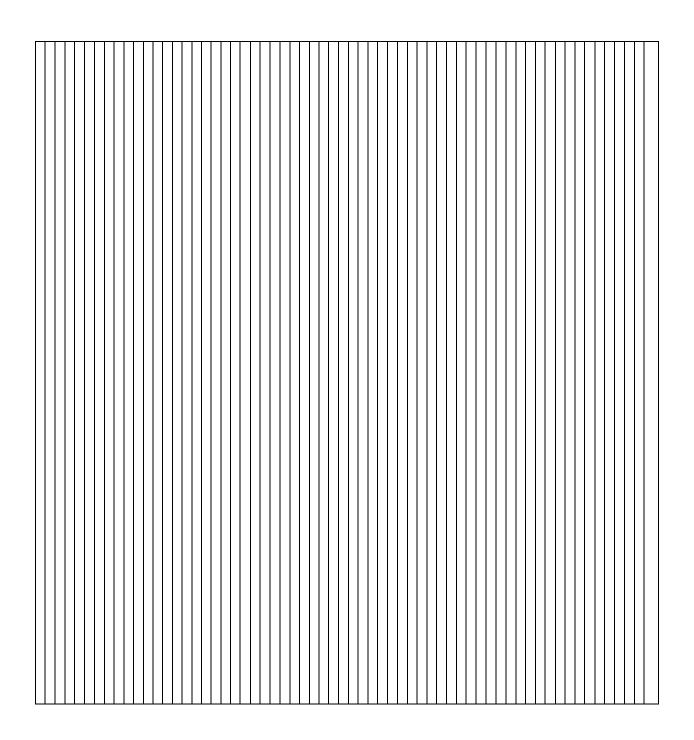


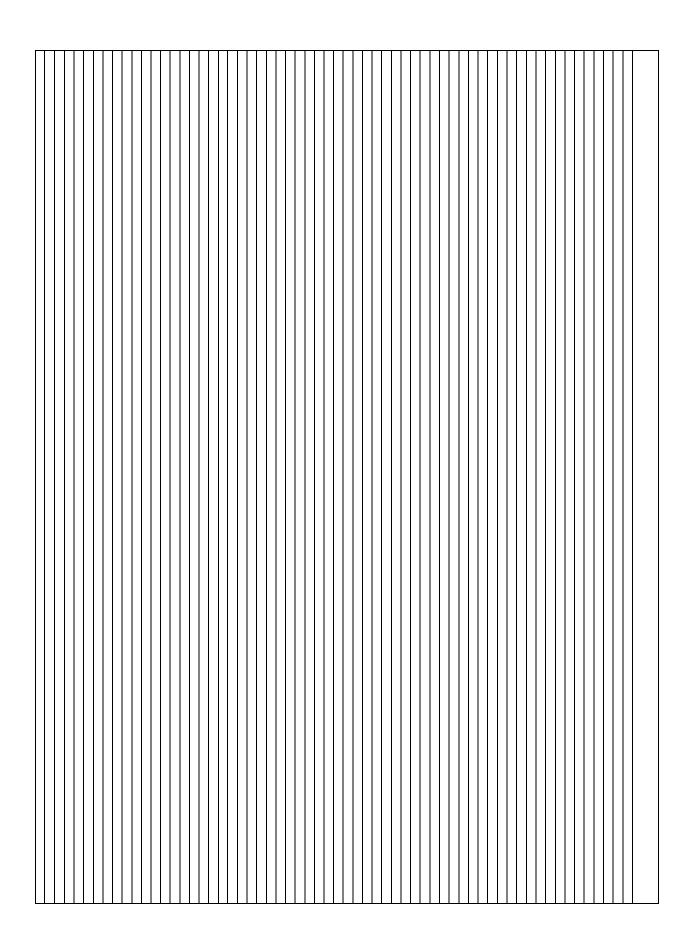


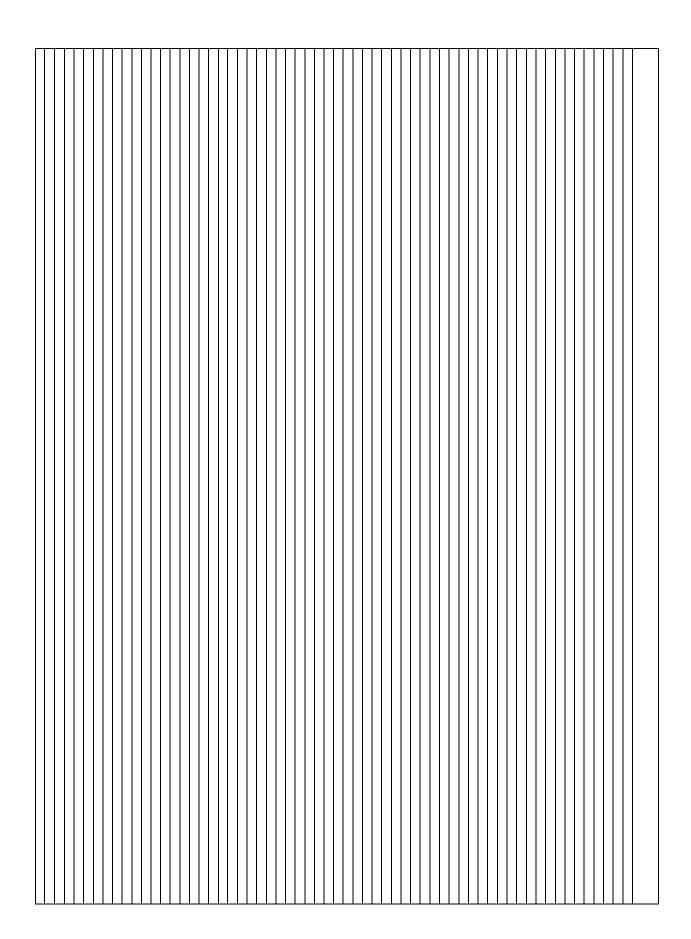


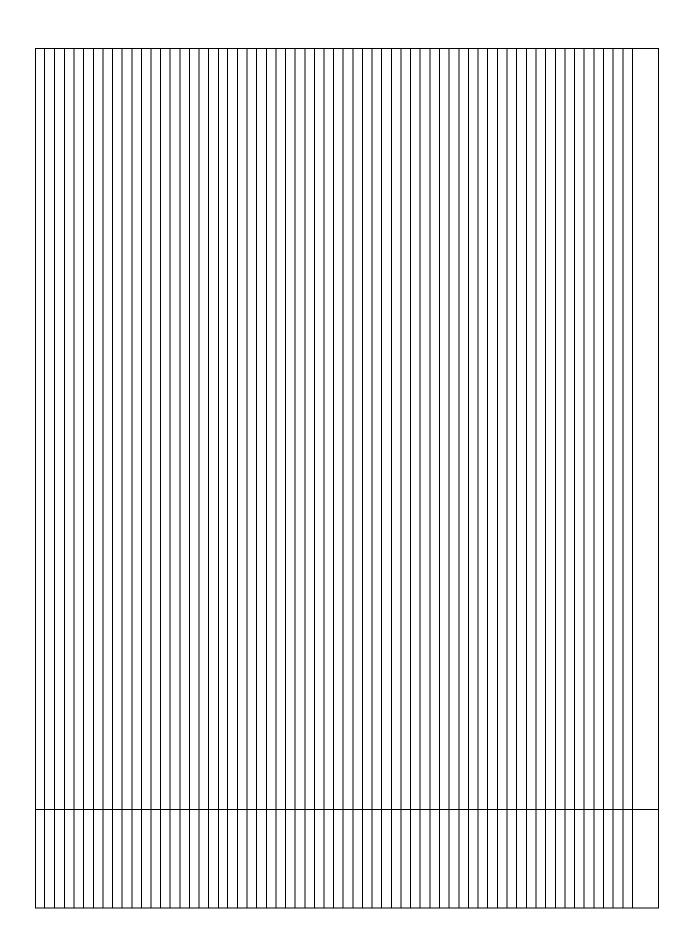


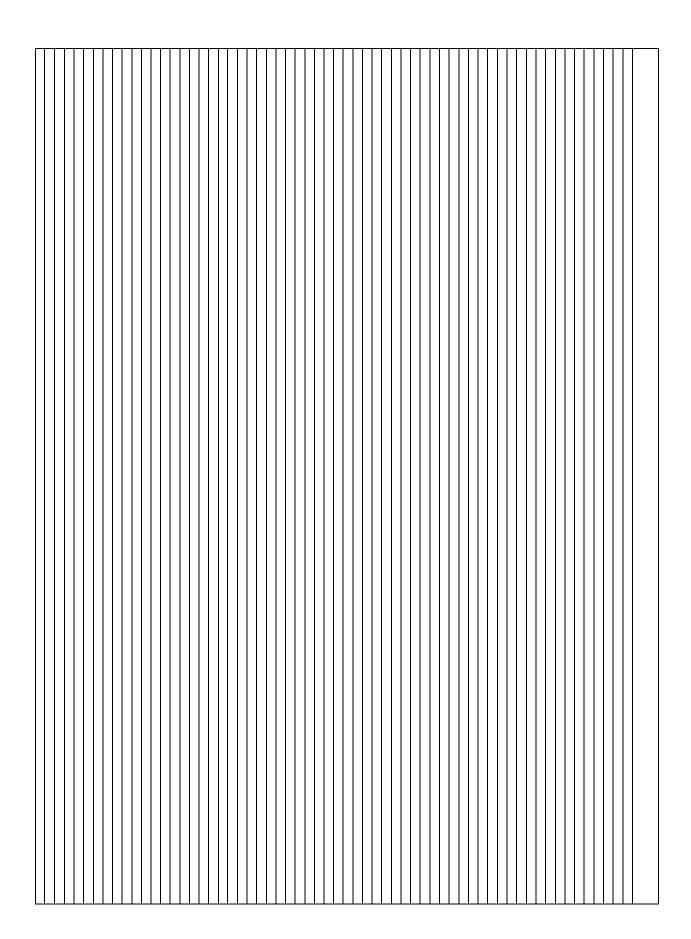


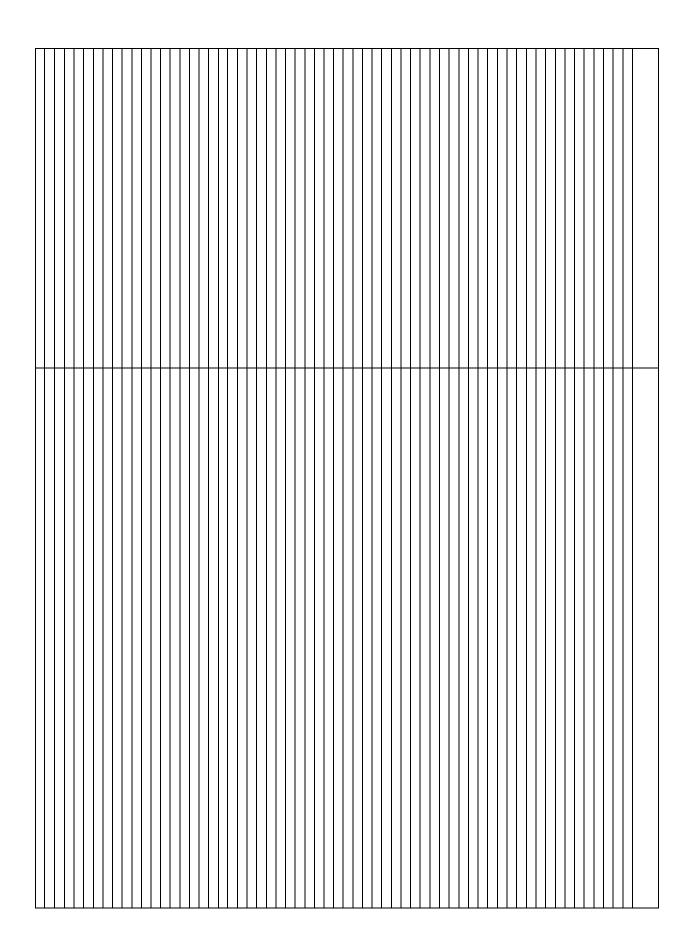


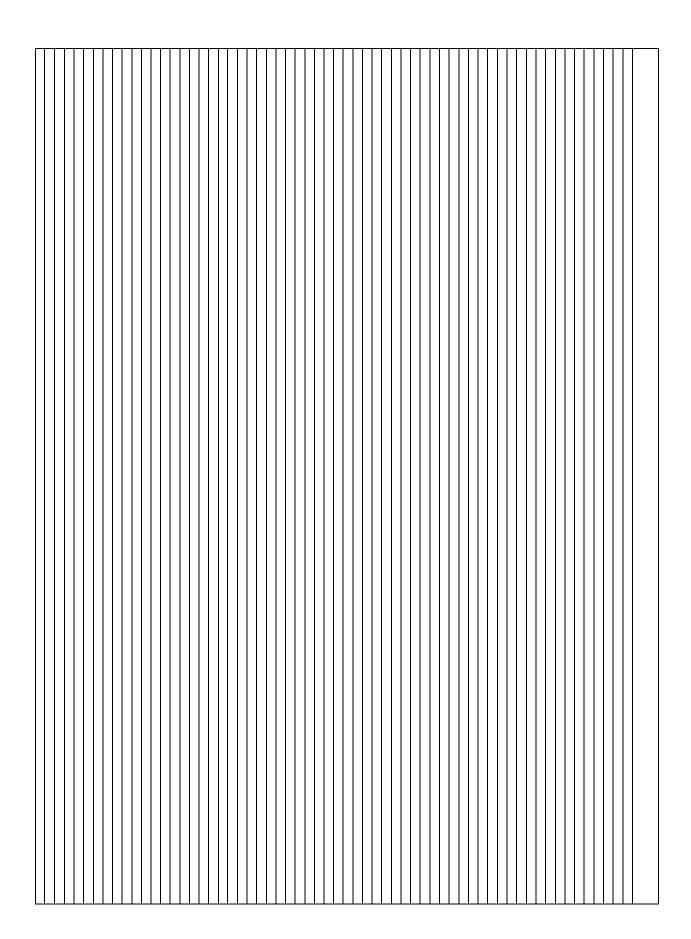


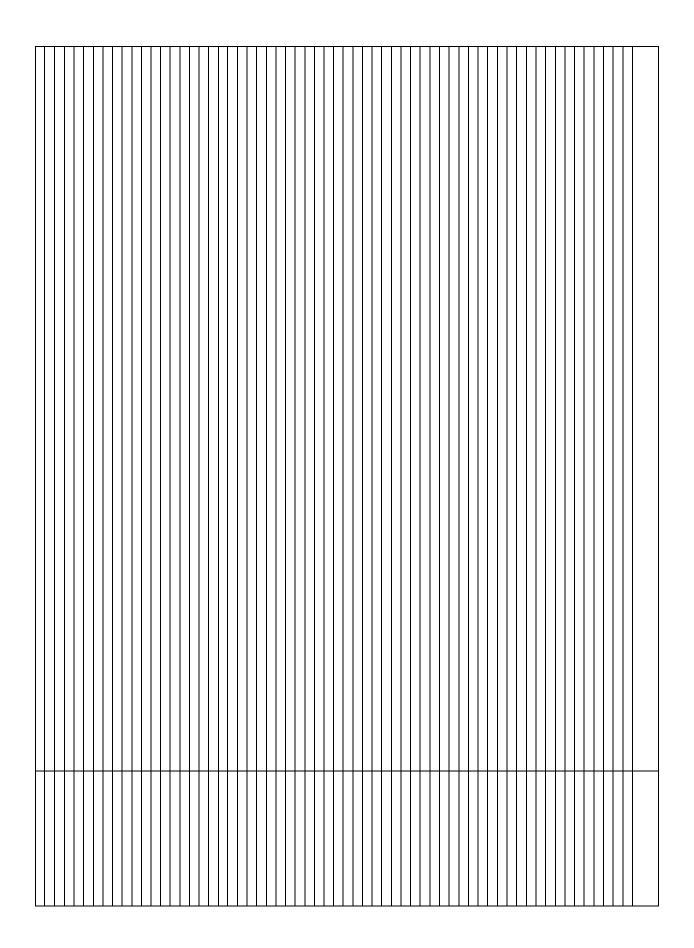


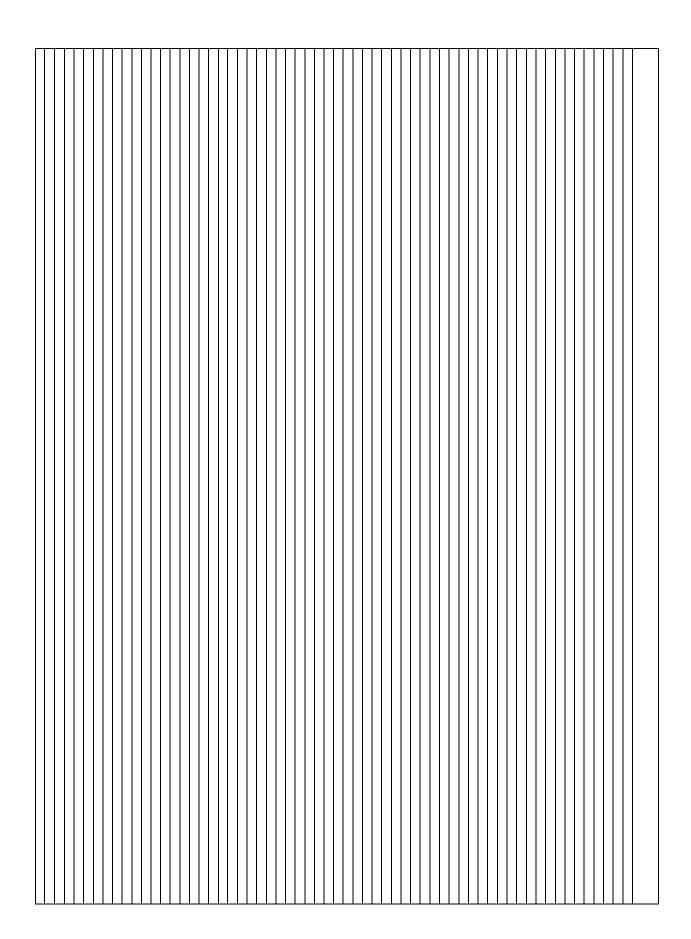


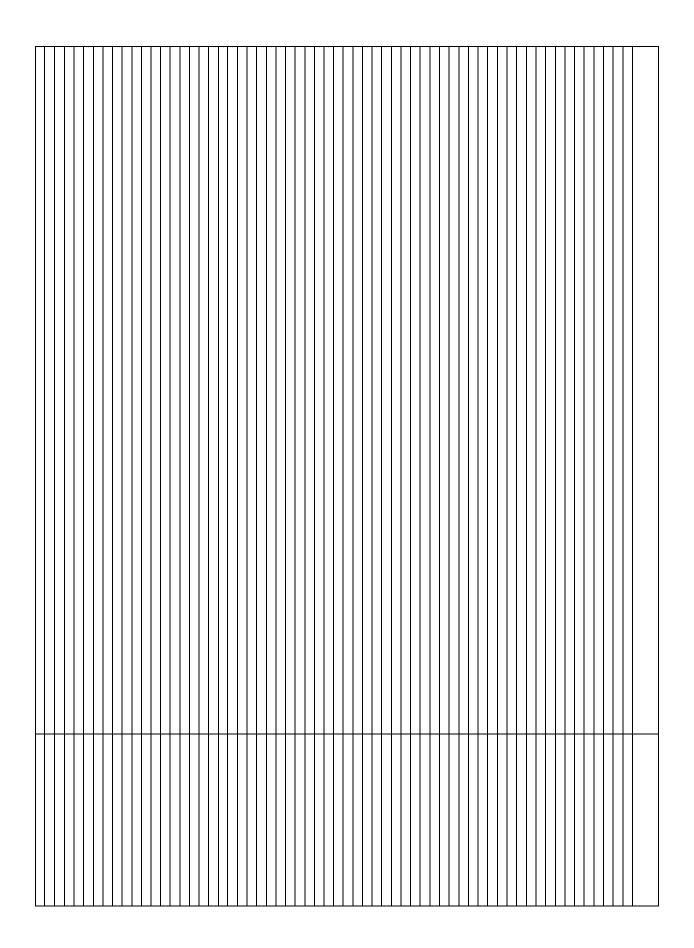


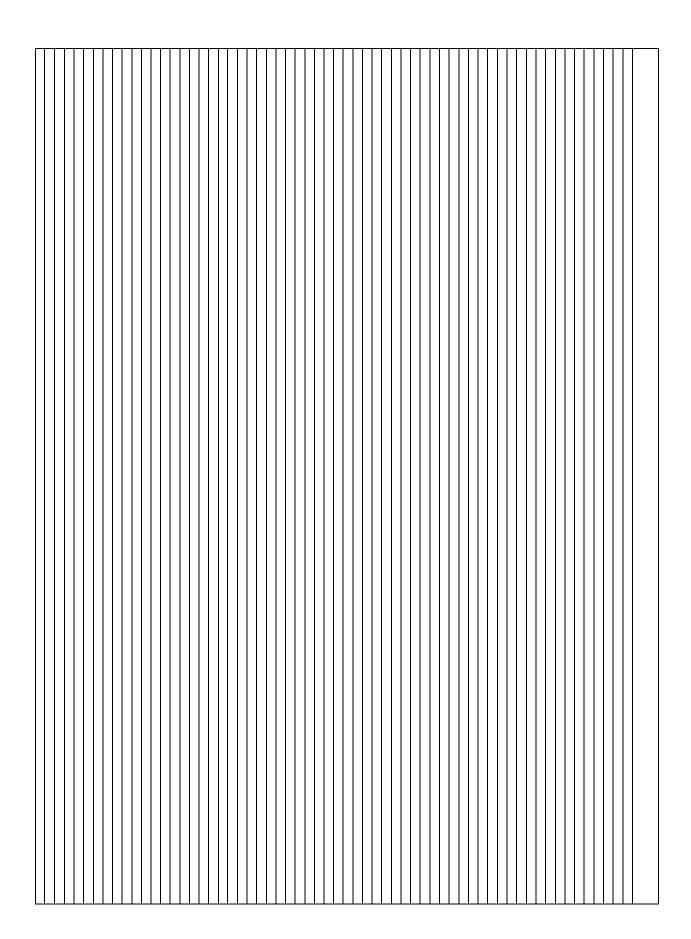


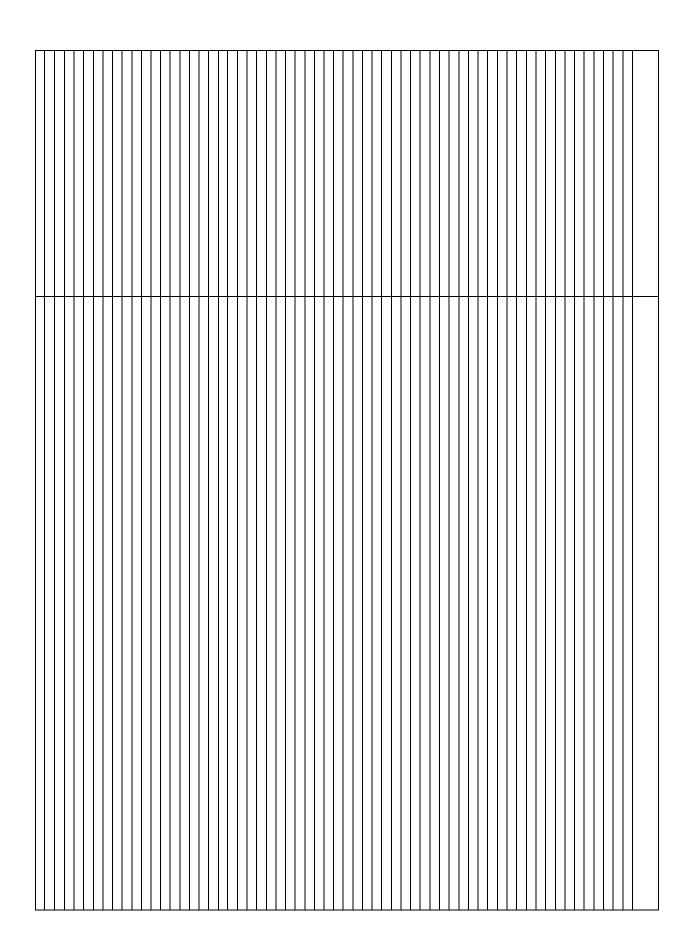


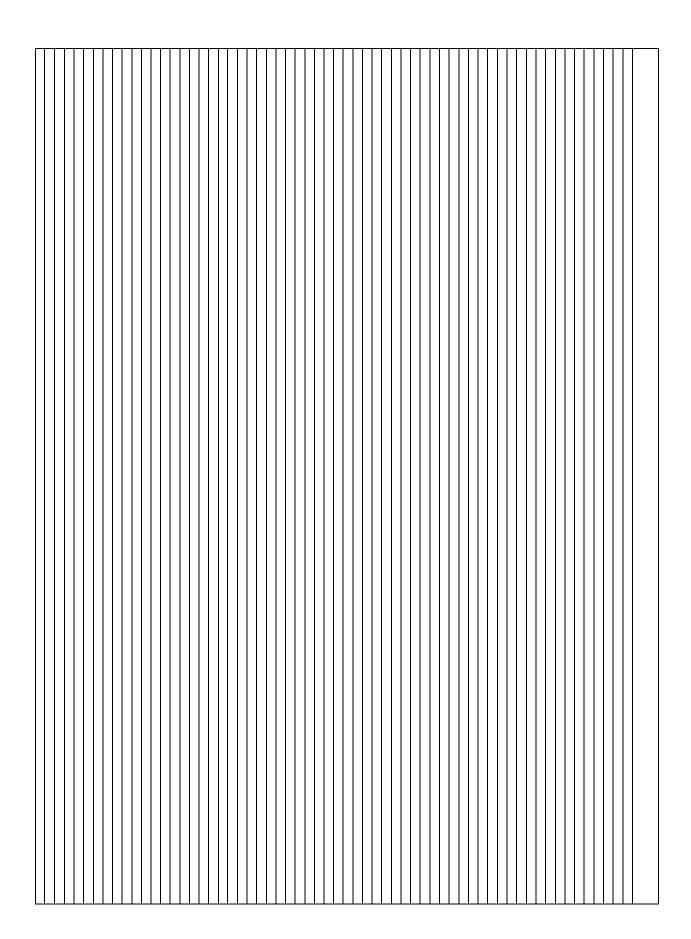


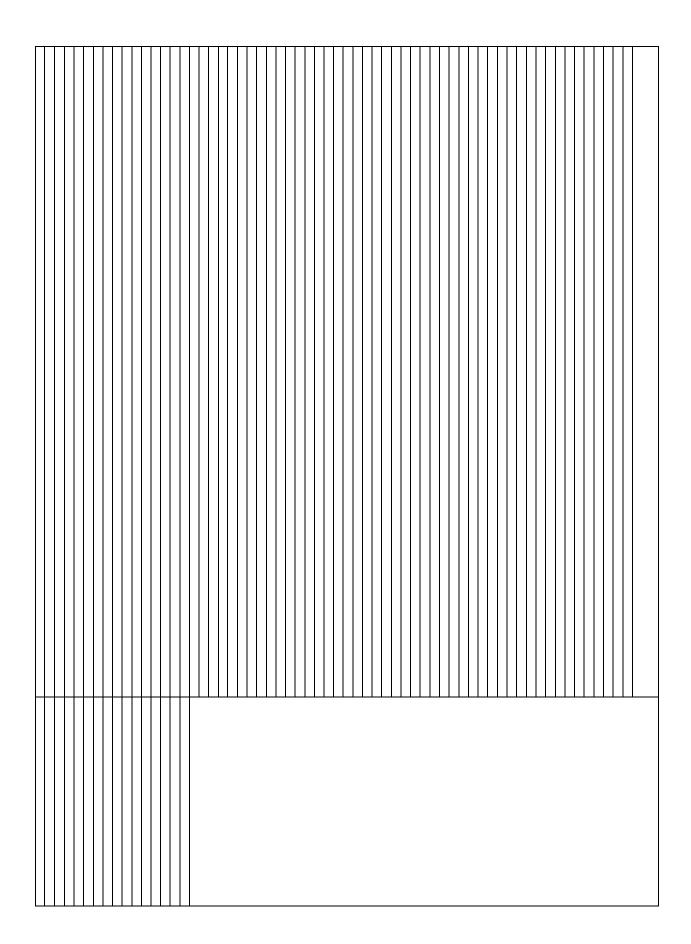












						•

## 7Commerce Court, Victoria

0000.0000000.000.0384620.0000000.0000000.0384620.000.0000000.0000000.0000000.0000000.0000000.0000009Davisville

Village0.0000000.0000000.0000000.0000000.0666670.0000000.0000000.0000000.0000000 00000.0000000.0666670.0000000.0000000.0000000.00666670.0000000.0000000.00000000000011First Canadian Place, Underground

00000.000.1333330.0000000.0000000.0000000.0333330.0666670.0000000.0000000.0000000.00000012Forest Hill North & West, Forest Hill Road

0.0000014Harbourfront East, Union Station, Toronto

0000015High Park, The Junction

000000.0000000.0000000.0000000.0000000.00526320.0000000.0000000.000000.0000000000.0000000.0000000.0000000.0526320.0000000.0526320.00.0000000.0000000.0000000.00000000017Kensington Market, Chinatown, Grange

000000.0000000.0666670.0333330.0000000.0333330.0666670.0000000.0000000.0000000.000000000018Lawrence

0000020Moore Park, Summerhill

00021North Toronto West, Lawrence

0000.00000023Queen's Park, Ontario Provincial

0000.0588240.0000000.0000000.0000000.0000000.0588240.0000000.0000000.0000000.0000000.000.00000024Regent Park,

00000.000.0666670.0000000.0000000.0000000.0666670.0000000.0000000.0000000.000

00.00000029St. James

0000030St. James Town,

 $\label{local_control$ 

0000032Studio

District0.0000000.0666670.0333330.0000000.0000000.00666670.0000000.000000.000000 0000033Summerhill West, Rathnelly, South Hill,

0.0000034The Annex, North Midtown,

00000.0000000.0000000.0000000.0000000.000.00.0454550.0454550.00.0000000.0000000.000000000.0000000.000.0000000.0000000.0000000.1363640.0000000.0000000.0000000.00000000.0000035The

## 0.0000036The Danforth West,

00.0000037Toronto Dominion Centre, Design

30.0000038University of Toronto,

```
In [23]:
toronto grouped.shape
                                                                  Out[23]:
(39, 177)
                                                                  In [24]:
num top venues = 5
for neigh in toronto grouped['Neighborhood']:
   print("---"+neigh+"---")
   temp = toronto grouped[toronto grouped['Neighborhood'] == neigh].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).he
ad(num top venues))
   print('\n')
----Berczy Park----
              venue freq
0 Seafood Restaurant 0.07
1
        Cheese Shop 0.07
       Cocktail Bar 0.07
         Coffee Shop 0.07
     Farmers Market 0.07
----Brockton, Parkdale Village, Exhibition Place----
                   venue freq
0
              Restaurant 0.07
1
      Italian Restaurant 0.07
2
               Gift Shop 0.07
3 Furniture / Home Store 0.07
             Coffee Shop 0.07
----Business reply mail Processing Centre, South Central Letter Processing
Plant Toronto----
        venue freq
          Café 0.10
1 Restaurant 0.07
2
       Hotel 0.07
3
       Theater 0.07
4 Concert Hall 0.07
```

```
----CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst
Quay, South Niagara, Island airport----
                 venue freq
    Italian Restaurant 0.10
1
                  Park 0.07
2 Gym / Fitness Center 0.07
3
            Restaurant 0.07
    Seafood Restaurant 0.03
----Central Bay Street----
                       venue freq
0
                 Coffee Shop 0.13
1
                       Plaza 0.07
2
              Sandwich Place 0.03
  Middle Eastern Restaurant 0.03
4 Modern European Restaurant 0.03
----Christie----
               venue freq
0
                Café 0.27
       Grocery Store 0.18
1
          Playground 0.09
3 Athletics & Sports 0.09
         Candy Store 0.09
----Church and Wellesley----
               venue freq
         Coffee Shop 0.10
1
         Men's Store 0.07
             Gay Bar 0.07
3 Salon / Barbershop 0.03
            Beer Bar 0.03
----Commerce Court, Victoria Hotel----
        venue freq
         Café 0.13
0
1
  Restaurant 0.10
   Gastropub 0.07
3 Coffee Shop 0.07
        Hotel 0.07
----Davisville----
               venue freq
        Dessert Shop 0.12
1
         Pizza Place 0.08
         Coffee Shop 0.08
3 Italian Restaurant 0.08
                Café 0.08
----Berczy Park----
               venue freq
```

0 Seafood Restaurant 0.07

```
Cheese Shop 0.07
2
        Cocktail Bar 0.07
3
         Coffee Shop 0.07
4
       Farmers Market 0.07
----Brockton, Parkdale Village, Exhibition Place----
                   venue freq
              Restaurant 0.07
0
       Italian Restaurant 0.07
1
               Gift Shop 0.07
3 Furniture / Home Store 0.07
4
             Coffee Shop 0.07
----Business reply mail Processing Centre, South Central Letter Processing
Plant Toronto----
         venue freq
0
          Café 0.10
   Restaurant 0.07
1
2
         Hotel 0.07
       Theater 0.07
4 Concert Hall 0.07
----CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst
Quay, South Niagara, Island airport----
                 venue freq
     Italian Restaurant 0.10
0
1
                  Park 0.07
2 Gym / Fitness Center 0.07
3
            Restaurant 0.07
    Seafood Restaurant 0.03
4
----Central Bay Street----
                       venue freq
0
                 Coffee Shop 0.13
1
                       Plaza 0.07
2
              Sandwich Place 0.03
  Middle Eastern Restaurant 0.03
3
4 Modern European Restaurant 0.03
----Christie----
               venue freq
                Café 0.27
0
1
       Grocery Store 0.18
2
          Playground 0.09
3 Athletics & Sports 0.09
         Candy Store 0.09
```

----Church and Wellesley----

```
venue freq
         Coffee Shop 0.10
1
         Men's Store 0.07
            Gay Bar 0.07
3 Salon / Barbershop 0.03
            Beer Bar 0.03
----Commerce Court, Victoria Hotel----
        venue freq
0
         Café 0.13
1
  Restaurant 0.10
2 Gastropub 0.07
3 Coffee Shop 0.07
        Hotel 0.07
----Davisville----
               venue freq
        Dessert Shop 0.12
        Pizza Place 0.08
1
         Coffee Shop 0.08
3 Italian Restaurant 0.08
                Café 0.08
----Davisville North----
              venue freq
     Breakfast Spot 0.2
0
               Park 0.2
1
2
              Hotel 0.2
  Department Store 0.2
4 Food & Drink Shop 0.2
----Dufferin, Dovercourt Village----
                      venue freq
     Furniture / Home Store 0.13
1
                      Park 0.13
                   Pharmacy 0.07
3 Middle Eastern Restaurant 0.07
                        Bar 0.07
----First Canadian Place, Underground city----
                   venue freq
0
                    Café 0.20
1
              Restaurant 0.13
             Coffee Shop 0.07
3
      Seafood Restaurant 0.07
4 Gluten-free Restaurant 0.03
```

----Forest Hill North & West, Forest Hill Road Park----

```
0
                       Park 1.0
                 Yoga Studio 0.0
1
2 Modern European Restaurant 0.0
3
                     Market 0.0
        Martial Arts School 0.0
----Garden District, Ryerson----
             venue freq
              Café 0.10
0
1 Ramen Restaurant 0.07
2 Coffee Shop 0.07
3
           Theater 0.07
4
            Hotel 0.03
----Harbourfront East, Union Station, Toronto Islands----
        venue freq
        Hotel 0.10
1 Coffee Shop 0.10
        Park 0.07
3
     Aquarium 0.07
        Plaza 0.07
4
----High Park, The Junction South----
                                    venue freq
0
                        Convenience Store 0.25
1
                                    Park 0.25
                           Sandwich Place 0.25
2
3 Residential Building (Apartment / Condo) 0.25
                          Organic Grocery 0.00
----India Bazaar, The Beaches West----
                 venue freq
0 Fast Food Restaurant 0.11
                  Pub 0.05
1
2
        Burrito Place 0.05
3
        Sandwich Place 0.05
                  Park 0.05
----Kensington Market, Chinatown, Grange Park----
                  venue freq
0
                  Café 0.10
    Mexican Restaurant 0.07
1
2 Vietnamese Restaurant 0.07
           Coffee Shop 0.07
3
4 Caribbean Restaurant 0.07
----Lawrence Park----
                      venue freq
0
                   Bus Line 0.5
                 Swim School 0.5
1
2
                 Yoga Studio 0.0
```

venue freq

```
3 Modern European Restaurant 0.0
        Martial Arts School
                             0.0
----Little Portugal, Trinity----
                  venue freq
0
                   Bar 0.10
1
           Cocktail Bar 0.07
2 Vietnamese Restaurant 0.07
       Asian Restaurant 0.07
4
           Yoga Studio 0.03
----Moore Park, Summerhill East----
                       venue freq
                         Gym 0.25
0
1
                        Park 0.25
                       Trail 0.25
2
3
                Tennis Court 0.25
4 Modern European Restaurant 0.00
----North Toronto West, Lawrence Park----
              venue freq
 Italian Restaurant 0.25
            Gym Pool 0.25
1
2
          Playground 0.25
3
                Park 0.25
         Yoga Studio 0.00
----Parkdale, Roncesvalles----
                       venue freq
                  Coffee Shop 0.10
               Breakfast Spot 0.07
1
2
                   Bookstore 0.07
3 Eastern European Restaurant 0.07
          American Restaurant 0.07
----Queen's Park, Ontario Provincial Government----
           venue freq
     Coffee Shop 0.24
1 Sandwich Place 0.12
2
       Gastropub 0.06
3
         Theater 0.06
            Café 0.06
4
----Regent Park, Harbourfront----
            venue freq
0
      Coffee Shop 0.24
1
  Breakfast Spot 0.10
2
      Yoga Studio 0.05
          Theater 0.05
3
4 Thai Restaurant 0.05
```

```
----Richmond, Adelaide, King----
                venue freq
                 Café 0.13
1
         Coffee Shop 0.10
                 Gym 0.07
2
3 American Restaurant 0.07
4 Restaurant 0.07
----Rosedale----
                      venue freq
0
                       Park 0.50
1
                  Playground 0.25
2
                 Bike Trail 0.25
3
                 Yoga Studio 0.00
4 Modern European Restaurant 0.00
----Roselawn----
               venue freq
        Home Service 1.0
         Yoga Studio 0.0
1
2 Monument / Landmark 0.0
3 Martial Arts School 0.0
      Massage Studio 0.0
----Runnymede, Swansea----
            venue freq
      Coffee Shop 0.13
           Café 0.10
Bakery 0.10
1
2
3
             Bank 0.07
4 Thai Restaurant 0.03
----St. James Town----
           venue freq
       Gastropub 0.10
0
1
           Café 0.10
2 Cosmetics Shop 0.07
   Coffee Shop 0.07
         Theater 0.07
4
----St. James Town, Cabbagetown----
              venue freq
Café 0.07
0
1
                Park 0.07
2
          Restaurant 0.07
         Coffee Shop 0.07
4 Italian Restaurant 0.07
----Stn A PO Boxes----
```

venue freq

```
Café 0.10
   Restaurant 0.07
1
         Hotel 0.07
3
       Theater 0.07
4 Concert Hall 0.07
----Studio District----
                venue freq
  Italian Restaurant 0.10
1
              Brewery 0.10
          Coffee Shop 0.07
2
3 Arts & Crafts Store 0.07
                Diner 0.07
----Summerhill West, Rathnelly, South Hill, Forest Hill SE, Deer Park---
                venue freq
   Light Rail Station 0.33
          Coffee Shop 0.33
1
2
         Liquor Store 0.17
          Supermarket 0.17
4 Monument / Landmark 0.00
----The Annex, North Midtown, Yorkville----
           venue freq
0 Sandwich Place 0.14
           Café 0.09
1
2 History Museum 0.05
             Pub 0.05
   Burger Joint 0.05
----The Beaches----
              venue freq
0 Health Food Store 0.2
1
  Asian Restaurant 0.2
2
              Trail 0.2
                Pub 0.2
3
        Yoga Studio
                    0.0
----The Danforth West, Riverdale----
            venue freq
     Grocery Store 0.12
1
             Park 0.12
2
          Bus Line 0.12
3 Business Service 0.12
   Ice Cream Shop 0.12
----Toronto Dominion Centre, Design Exchange----
               venue freq
0
                Café 0.17
```

```
1
         Coffee Shop 0.17
           Restaurant 0.07
3 Japanese Restaurant 0.07
          Art Gallery 0.03
----University of Toronto, Harbord----
                venue freq
               Bakery 0.10
0
                 Café 0.10
1
           Restaurant 0.07
3 Japanese Restaurant 0.07
            Bookstore 0.07
                                                                      In [25]:
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 [26]:
import numpy as np
num top venues = 10
indicators = ['st', 'nd', 'rd']
columns = ['Neighborhood']
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))
neighborhoods venues sorted = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted['Neighborhood'] = toronto_grouped['Neighborhood']
for ind in np.arange(toronto grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(tor
onto grouped.iloc[ind, :], num top venues)
neighborhoods venues sorted.shape
                                                                      Out[26]:
(39, 11)
```

```
In [27]:
```

```
from sklearn.cluster import KMeans
import sklearn.cluster.k means
km = KMeans(n clusters=3, init='k-means++', max_iter=100, n_init=1,
 verbose=True)
/home/untold/anaconda3/lib/python3.8/site-packages/sklearn/utils/deprecation.
py:143: FutureWarning: The sklearn.cluster.k_means_ module is deprecated in
version 0.22 and will be removed in version 0.24. The corresponding classes /
functions should instead be imported from sklearn.cluster. Anything that cann
ot be imported from sklearn.cluster is now part of the private API.
  warnings.warn(message, FutureWarning)
                                                                      In [28]:
kclusters = 10
toronto_grouped_clustering = toronto_grouped.drop('Neighborhood', 1)
kmeans = KMeans(n clusters=kclusters, random state=1).fit(toronto grouped clu
stering)
print(kmeans.labels [0:10])
print(len(kmeans.labels))
[0 0 3 0 0 3 0 3 0 0]
39
                                                                      In [29]:
df.head()
```

Out[29]:

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e e
0	M 4 E	E a s t	T h e B	4 3 6	- 7 9

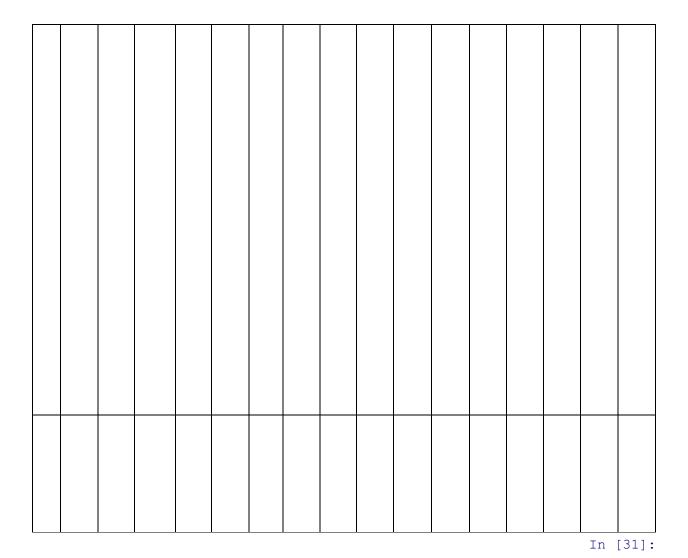
	P o s t a l c o d	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
	n	T o r o n t o n	e a c h e s	7 7 0 9	2 9 5 4 7
1	M 4 K \ n	E a s t T o r o n t o n	T h e D a n f o r t h W e s t , R i v e	4 3 6 8 3 7 5	7 9 3 5 5 1 2

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
			r d a l e		
2	M 4 L \ n	E a s t T o r o n t o n	I n d i a B a z a a r , T h e B e a c h e s W e	4 3 6 6 7 9 7	- 7 9 3 1 4 6 7

	P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
			s t		
3	M 4 M \ n	E a s t T o r o n t o	S t u d i o D i s t r i c t	4 3 6 6 2 1 3	7 9 3 3 4 9 7
4	M 4 N \ n	C e n t r a l T o r	L a w r e n c e P a	4 3 7 2 8 4 3	7 9 3 8 7 1 3

P o s t a l c o d e	B o r o u g h	N e i g h b o r h o o d	L a t i t u d e	L o n g i t u d e
	n t o \ n	r k		

```
In [30]:
neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)
toronto_merged = df
toronto_merged = toronto_merged.join(neighborhoods_venues_sorted.set_index('N eighborhood'), on='Neighborhood')
toronto_merged.head() # check the last columns!
Out[30]:
```



```
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

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]

markers_colors = []
for lat, lon, poi, cluster in zip(toronto_merged['Latitude'], toronto_merged['Longitude'], toronto_merged['Neighborhood'], kmeans.labels_):
    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
```

Make this Notebook Trusted to load map: File -> Trust Notebook