A full report consisting of all of the following components (15 marks):

Introduction where you discuss the business problem and who would be interested in this project.

In this Capstone project I will be identifying areas in Northern Ireland and Belfast City that have schools and what other venues are in these locations. The project may support young couples or families in Northern Ireland that are looking to invest in their first home or move while considering local schools if they hope to raise or are raising children in this new home, while also considering what other venues are within the vicinity.

This project will allow me to leverage the Foursquare location data to solve and execute the results, which will identify the venues around the schools. The school locations were obtained from Open Data NI.

This audience of young couples and families would care about this problem because they may be making a large investment on a new home and would like to know if the location is suitable for their needs and suit raising a family in the future based on where their children can go to school and which town has suitable venues that suit their needs.

Data where you describe the data that will be used to solve the problem and the source of the data.

The data I am using is from a csv file which is publicly available on Open Data NI from the following link;

https://www.opendatani.gov.uk/dataset/locate-a-school/resource/d0947faf-5d84-4ce4-80dd-ce4fa0e1c0d5

I included the whole csv file in my notebook, however I found the following columns particularly useful; Institution Name, Town Name, County Name, Postcode, Latitude and Longitude;

Institution_Name	Town_Name	County_Name	Postcode	Latitude	Longitude
174 Trust Playgroup	BELFAST	ANTRIM	BT146BP	54.61253	-5.93645
Abbey Christian Brothers Grammar School	NEWRY	DOWN	BT342QN	54.19349	-6.32846
Abbey Community College	NEWTOWNABBEY	ANTRIM	BT370EA	54.69015	-5.91848
Abbey Primary School	NEWTOWNARDS	DOWN	BT238RQ	54.59601	-5.66723
Abbots Cross Primary School	NEWTOWNABBEY	ANTRIM	BT379QW	54.66801	-5.91408

This is what the first five rows look like in my Jupyter notebook;

```
#using csv file provided rather than geocoder package
schools = pd.read_csv('NISchools.csv')
```

```
schools.head()
```

	Institution_Name	Address_1	Address_2	Address_3	Town_Name	County_Name	Postcode	Institution_Type	Management_Type	Latitude	L
0	174 Trust Playgroup	Duncairn Complex	1 Duncairn Avenue	NaN	BELFAST	ANTRIM	BT146BP	VP Pre-schools	Other	54.61253	
1	Abbey Christian Brothers Grammar School	77a Ashgrove Road	NaN	NaN	NEWRY	DOWN	BT342QN	Secondary (grammar) school	Voluntary	54.19349	
2	Abbey Community College	Bridge Road	Monkstown	NaN	NEWTOWNABBEY	ANTRIM	BT370EA	Secondary (non-grammar) school	Controlled	54.69015	
3	Abbey Primary School	90 MOVILLA ROAD	NaN	NaN	NEWTOWNARDS	DOWN	BT238RQ	Primary school	Controlled	54.59601	
4	Abbots Cross Primary School	86 DOAGH ROAD	NaN	NaN	NEWTOWNABBEY	ANTRIM	BT379QW	Primary school	Controlled	54.66801	

In total there were 1342 Schools, also referred to as Institution Names in the data set and 1301 Postcodes as per below. Fewer Postcodes suggests some schools may be located at the same address;

```
print('The dataframe has {} Schools and {} Postcodes.'.format(
        len(schools['Institution_Name'].unique()),
        len(schools['Postcode'].unique()),
        #schools.shape[0]
    )
)
```

```
The dataframe has 1342 Schools and 1301 Postcodes.
```

I used the csv file in combination with the Foursquare location data which was used to explore the schools and segment them. I experienced and resolved issues with the API call volume which has taught me to be conscious while using Foursquare APIs in the future.

The foursquare data identified venues such as Supermarket, Park and Bus Stop which may be venues our audience require near their new home. The data frame from Foursquare looked like this;

	Neighborhood	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
0	BT100DR	Sandwich Place	Health & Beauty Service	Fast Food Restaurant	Coffee Shop	Grocery Store	Supermarket	Flower Shop	Construction & Landscaping	Weight Loss Center
1	BT100HT	Warehouse Store	Hotel Bar	Fast Food Restaurant	Supermarket	Weight Loss Center	Flower Shop	French Restaurant	Forest	Food Court
2	BT100JB	Chinese Restaurant	Train Station	Auto Workshop	Pub	Weight Loss Center	Flower Shop	French Restaurant	Forest	Food Court
3	BT100LE	Park	Coffee Shop	Bus Stop	Weight Loss Center	Food	Fried Chicken Joint	French Restaurant	Forest	Food Court
4	BT100LF	Athletics & Sports	Weight Loss Center	Flower Shop	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop

Methodology section which represents the main component of the report where you discuss and describe any exploratory data analysis that you did, any inferential statistical testing that you performed, if any, and what machine learnings were used and why.

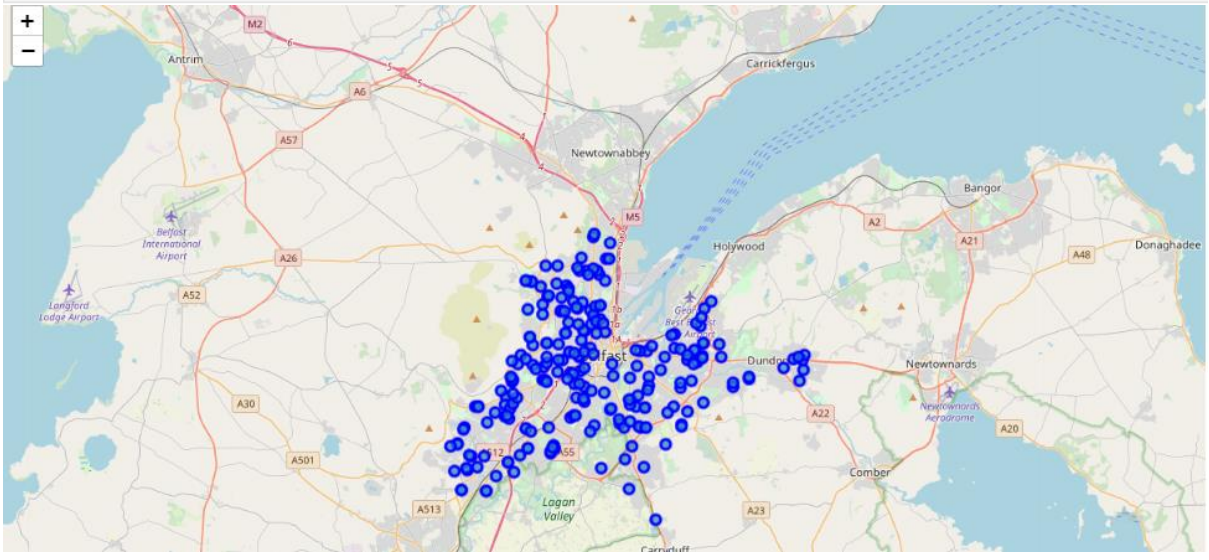
I initially created a map using Folium of Northern Ireland which didn't disclose useful information so I decided to drill down into the data and focus on Belfast City. I was also conscious too of implementing Foursquare where API calls are restricted. I proceeded to get the geographical coordinates of Belfast;

```
address = 'Belfast, GB'

geolocator = Nominatim(user_agent="ni_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Belfast are {}, {}.'.format(latitude, longitude))
```

```
The geograpical coordinate of Belfast are 54.5964411, -5.9302761.
```

Using Folium I created the following map of Belfast schools;

```
# create map of Belfast using latitude and longitude values
map_belfast = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, label in zip(belfast_data['Latitude'], belfast_data['Longitude'], belfast_data['Town_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_belfast)

map_belfast
```



I initially explored the first school based on its Postcode in the new Belfast dataframe and proceeded to view the top 100 in Belfast within a radius of 500 metres. The top 5 nearby venues in Belfast looked like this;

```
print(belfast_venues.shape)
belfast_venues.head()
```

```
(1358, 7)
```

	Postcode	Postcode Latitude	Postcode Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	BT146BP	54.61253	-5.93645	Domino's Pizza	54.616018	-5.937208	Pizza Place
1	BT146BP	54.61253	-5.93645	Total Home NI	54.614306	-5.942949	Home Service
2	BT146BP	54.61253	-5.93645	Cuffs Bar & Grill	54.609333	-5.941384	English Restaurant
3	BT60BY	54.57617	-5.90744	Kingspan Stadium	54.576490	-5.904229	Stadium
4	BT60BY	54.57617	-5.90744	Cherryvale Playing Fields	54.574193	-5.912665	Field

I also investigated how many venues were at each school based on their Postcode;

```
belfast_venues.groupby('Postcode').count()
```

Postcode	Postcode Latitude	Postcode Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
BT100DR	16	16	16	16	16	16
BT100HT	4	4	4	4	4	4
BT100JB	8	8	8	8	8	8
BT100LE	3	3	3	3	3	3
BT100LF	1	1	1	1	1	1
BT100NE	4	4	4	4	4	4
BT10OJB	4	4	4	4	4	4
BT118AY	4	4	4	4	4	4
BT118BL	3	3	3	3	3	3
BT118EF	1	1	1	1	1	1
BT118EG	1	1	1	1	1	1
BT118EJ	1	1	1	1	1	1
BT118HR	2	2	2	2	2	2

Having identified the venues I analysed each school using one hot encoding where I converted the categorical variables. I identified the top 5 venues at each school which would help distinguish differences for the audience.

```
# one hot encoding
belfast_onehot = pd.get_dummies(belfast_venues[['Venue Category']], prefix="", prefix_sep="")

# add School postcode column back to dataframe
belfast_onehot['Postcode'] = belfast_venues['Postcode']

# move postcode column to the first column
fixed_columns = [belfast_onehot.columns[-1]] + list(belfast_onehot.columns[:-1])
belfast_onehot = belfast_onehot[fixed_columns]

belfast_onehot.head()
```

	Postcode	American Restaurant	Asian Restaurant	Athletics & Sports	Auto Workshop	BBQ Joint	Bakery	Bar	Bed & Breakfast	Beer Bar	Beer Garden	Bistro	Boat or Ferry	Bookstore	Botanical Garden	Boutique	Breakfast Spot	Burger Joint	Burrito Place
0	BT146BP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	BT146BP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	BT146BP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	BT60BY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	BT60BY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

This resulted in a data frame size of (1358, 147) and once grouped by postcode the new data frame size was (184, 147). I then investigated each school's top five venues, for example;

```
num_top_venues = 5

for school in belfast_grouped['Postcode']:
    print("----"+school+"----")
    temp = belfast_grouped[belfast_grouped['Postcode'] == school].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')
```

```
----BT100DR----
                       venue  freq
0        Fast Food Restaurant  0.12
1     Health & Beauty Service  0.12
2                 Coffee Shop  0.12
3  Construction & Landscaping  0.12
4                 Supermarket  0.12


----BT100HT----
                  venue  freq
0             Hotel Bar  0.25
1       Warehouse Store  0.25
2  Fast Food Restaurant  0.25
3           Supermarket  0.25
4           Opera House  0.00
```

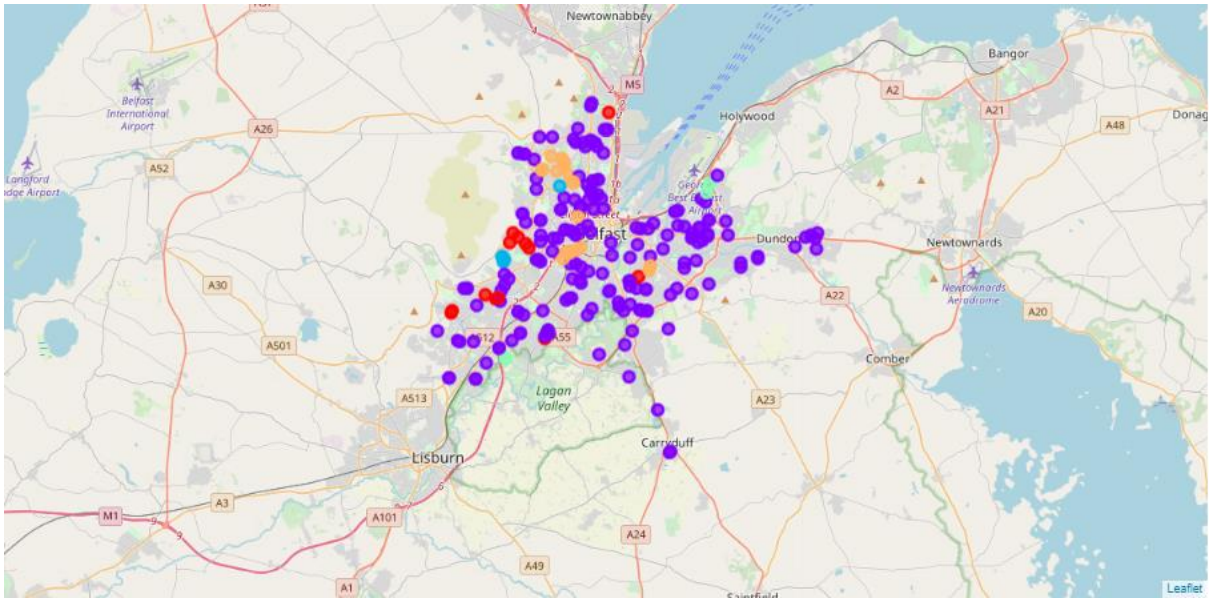
Following this I used k-means to cluster the schools with similar venue nearby into 5 clusters. The new data frame which included the clusters as well as the top 10 venues for each school looked like this;

```
# add clustering labels
postcode_venues_sorted.insert(0, 'ClusterLab', kmeans.labels_)

belfast_merged = belfast_data

# merge belfast_grouped with belfast_data to add latitude/longitude for each postcode
belfast_merged = belfast_merged.join(postcode_venues_sorted.set_index('Postcode'), on='Postcode')

belfast_merged.head()
```

	Institution_Name	Town_Name	County_Name	Postcode	Latitude	Longitude	ClusterLab	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
0	174 Trust Playgroup	BELFAST	ANTRIM	BT146BP	54.61253	-5.93645	1.0	Home Service	Pizza Place	English Restaurant	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court
1	Aquinas Diocesan Grammar School	BELFAST	ANTRIM	BT60BY	54.57617	-5.90744	1.0	Café	Pub	Coffee Shop	Stadium	Golf Course	Sandwich Place	Liquor Store	Ramen Restaurant
2	Arellian Nursery School	BELFAST	ANTRIM	BT125NS	54.59053	-5.94569	4.0	Convenience Store	Grocery Store	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
3	Ashfield Boys' High School	BELFAST	ANTRIM	BT42LY	54.60831	-5.86252	1.0	Athletics & Sports	Trail	Park	Playground	Fish & Chips Shop	French Restaurant	Forest	Food Court
4	Ashfield Girls' High School	BELFAST	ANTRIM	BT42LY	54.60960	-5.86554	1.0	Athletics & Sports	Trail	Park	Playground	Fish & Chips Shop	French Restaurant	Forest	Food Court

Results section where you discuss the results.

Once empty rows were dropped and data types amended the five clusters were plotted on the cluster map was as follows using Folium;



As you can see the clusters are not very even in size, they appear to overlap. I examined further to determine the differentiating venue categories that distinguish each cluster. A sample of each cluster is below;

All of Cluster 1;

Cluster 1

```
belfast2.loc[belfast_merged['ClusterLab'] == 0, belfast2.columns[[1] + list(range(5, belfast2.shape[1]))]]
```

	Town Name	Longitude	ClusterLab	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
25	BELFAST	-5.97886	0	Construction & Landscaping	Martial Arts Dojo	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
28	BELFAST	-6.00466	0	Furniture / Home Store	Construction & Landscaping	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
53	BELFAST	-5.90589	0	Construction & Landscaping	Stadium	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Weight Loss Center
66	BELFAST	-5.96605	0	Business Service	Grocery Store	Construction & Landscaping	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Weight Loss Center
80	BELFAST	-6.02607	0	Print Shop	Construction & Landscaping	Weight Loss Center	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Fish & Chips Shop
102	BELFAST	-5.98863	0	Construction & Landscaping	Weight Loss Center	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
123	BELFAST	-5.98701	0	Construction & Landscaping	Weight Loss Center	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
166	BELFAST	-5.98322	0	Construction & Landscaping	Martial Arts Dojo	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
174	BELFAST	-5.99776	0	Construction & Landscaping	Gym / Fitness Center	Auto Workshop	Fish & Chips Shop	Food	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop
190	BELFAST	-5.97678	0	Construction & Landscaping	Martial Arts Dojo	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
194	BELFAST	-5.92493	0	Construction & Landscaping	Chinese Restaurant	Fish & Chips Shop	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
196	BELFAST	-5.99660	0	Construction & Landscaping	Gym / Fitness Center	Auto Workshop	Fish & Chips Shop	Food	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop
221	BELFAST	-6.02650	0	Print Shop	Construction & Landscaping	Weight Loss Center	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Fish & Chips Shop

Sample of Cluster 2;

Cluster 2

```
belfast2.loc[belfast2['ClusterLab'] == 1, belfast2.columns[[1] + list(range(5, belfast2.shape[1]))]]
```

	Town Name	Longitude	ClusterLab	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	BELFAST	-5.93645	1	Home Service	Pizza Place	English Restaurant	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
1	BELFAST	-5.90744	1	Cafe	Pub	Coffee Shop	Stadium	Golf Course	Sandwich Place	Liquor Store	Ramen Restaurant	French Restaurant	Hotel
3	BELFAST	-5.86252	1	Athletics & Sports	Trail	Park	Playground	Fish & Chips Shop	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
4	BELFAST	-5.86554	1	Athletics & Sports	Trail	Park	Playground	Fish & Chips Shop	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
5	BELFAST	-5.79129	1	Home Service	Theme Park	Martial Arts Dojo	Fast Food Restaurant	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
6	BELFAST	-5.96992	1	Plaza	Scenic Lookout	Weight Loss Center	Fish & Chips Shop	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
7	BELFAST	-5.96157	1	Plaza	Dog Run	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Fish & Chips Shop
9	BELFAST	-5.93908	1	Pizza Place	Bar	Grocery Store	Café	Farmers Market	Fast Food Restaurant	Field	Event Space	Fire Station	Frozen Yogurt Shop
10	BELFAST	-5.86641	1	Pizza Place	Café	Coffee Shop	Restaurant	Mexican Restaurant	Chinese Restaurant	Fast Food Restaurant	Bakery	Bar	Sandwich Place
11	BELFAST	-5.86641	1	Pizza Place	Café	Coffee Shop	Restaurant	Mexican Restaurant	Chinese Restaurant	Fast Food Restaurant	Bakery	Bar	Sandwich Place
12	BELFAST	-5.93096	1	Sports Club	Convenience Store	Fire Station	Soccer Field	Theater	Weight Loss Center	Flower Shop	French Restaurant	Forest	Food Court
13	BELFAST	-5.93679	1	Golf Course	Trail	Liquor Store	Pub	Café	Historic Site	Event Space	English Restaurant	Farmers Market	Fast Food Restaurant
14	BELFAST	-5.98179	1	Sandwich Place	Health & Beauty Service	Fast Food Restaurant	Coffee Shop	Grocery Store	Supermarket	Flower Shop	Construction & Landscaping	Weight Loss Center	Forest
15	BELFAST	-5.91050	1	Golf Course	Pub	Café	Coffee Shop	Fast Food Restaurant	Liquor Store	Sandwich Place	Indian Restaurant	Asian Restaurant	Beer Bar
16	BELFAST	-5.97868	1	Park	Weight Loss Center	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Fish & Chips Shop
17	BELFAST	-5.86458	1	Pizza Place	Coffee Shop	Café	Bar	Italian Restaurant	Mexican Restaurant	Chinese Restaurant	Fast Food Restaurant	Supermarket	Gastropub
19	BELFAST	-5.92933	1	Coffee Shop	Café	Grocery Store	Hostel	Asian Restaurant	Botanical Garden	BBQ Joint	Chinese Restaurant	Garden	Department Store
20	BELFAST	-5.86060	1	Chinese Restaurant	Weight Loss Center	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
21	BELFAST	-5.91503	1	Asian Restaurant	Chinese Restaurant	Sandwich Place	Thai Restaurant	Weight Loss Center	Food	French Restaurant	Forest	Food Court	Food & Drink Shop

All of Cluster 3;

Cluster 3

```
belfast2.loc[belfast2['ClusterLab'] == 2, belfast2.columns[[1] + list(range(5, belfast2.shape[1]))]]
```

	Town Name	Longitude	ClusterLab	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
74	BELFAST	-5.99312	2	Fish & Chips Shop	Weight Loss Center	Food	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Flower Shop
93	BELFAST	-5.95655	2	Movie Theater	Fish & Chips Shop	Weight Loss Center	Food	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Flower Shop
98	BELFAST	-5.99373	2	Fish & Chips Shop	Weight Loss Center	Food	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Flower Shop
133	BELFAST	-5.99267	2	Fish & Chips Shop	Weight Loss Center	Food	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Flower Shop
191	BELFAST	-5.99347	2	Fish & Chips Shop	Weight Loss Center	Food	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Flower Shop

All of Cluster 4;

Cluster 4

```
belfast2.loc[belfast2['ClusterLab'] == 3, belfast2.columns[[1] + list(range(5, belfast2.shape[1]))]]
```

	Town Name	Longitude	ClusterLab	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
77	BELFAST	-5.85986	3	Ice Cream Shop	Athletics & Sports	Weight Loss Center	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
128	BELFAST	-5.86157	3	Athletics & Sports	Weight Loss Center	Flower Shop	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
149	BELFAST	-5.99155	3	Athletics & Sports	Weight Loss Center	Flower Shop	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food

Sample of Cluster 5;

Cluster 5

```
belfast2.loc[belfast2['ClusterLab'] == 4, belfast2.columns[[1] + list(range(5, belfast2.shape[1]))]]
```

	Town Name	Longitude	ClusterLab	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	BELFAST	-5.94569	4	Convenience Store	Grocery Store	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Weight Loss Center
8	BELFAST	-5.95533	4	Gym	Grocery Store	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Weight Loss Center
18	BELFAST	-5.94318	4	Hotel	Grocery Store	Convenience Store	Event Space	Farmers Market	Fast Food Restaurant	Field	Fire Station	Fish & Chips Shop	Funeral Home
26	BELFAST	-5.95029	4	Grocery Store	Fish & Chips Shop	Movie Theater	Funeral Home	Soccer Stadium	Farmers Market	Fast Food Restaurant	Field	Fire Station	Event Space
32	BELFAST	-5.96208	4	Grocery Store	Home Service	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
52	BELFAST	-5.95260	4	Grocery Store	Weight Loss Center	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
67	BELFAST	-5.89857	4	Grocery Store	Auto Workshop	Gas Station	Bakery	Department Store	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court
85	BELFAST	-5.89870	4	Grocery Store	Auto Workshop	Gas Station	Department Store	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop
91	BELFAST	-5.96865	4	Grocery Store	Bar	Gym / Fitness Center	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
139	BELFAST	-5.94765	4	Grocery Store	Soccer Stadium	Electronics Store	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
144	BELFAST	-5.95411	4	Grocery Store	Fish & Chips Shop	Funeral Home	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
145	BELFAST	-5.95389	4	Grocery Store	Fish & Chips Shop	Funeral Home	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
146	BELFAST	-5.94820	4	Home Service	Grocery Store	Soccer Stadium	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
148	BELFAST	-5.96865	4	Grocery Store	Bar	Gym / Fitness Center	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
153	BELFAST	-5.94820	4	Home Service	Grocery Store	Soccer Stadium	Flower Shop	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food
160	BELFAST	-5.94472	4	Grocery Store	Public Art	Sandwich Place	Fast Food Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop	Fish & Chips Shop
232	BELFAST	-5.95042	4	Grocery Store	Weight Loss Center	Funeral Home	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food	Flower Shop
235	BELFAST	-5.96771	4	Grocery Store	Bar	Gym / Fitness Center	Weight Loss Center	Fried Chicken Joint	French Restaurant	Forest	Food Court	Food & Drink Shop	Food

Discussion section where you discuss any observations you noted and any recommendations you can make based on the results.

Given the audience of this project may be young couples or families trying to find a home based on schools I have made a suggestion on each what may suit certain individuals reviewing each cluster as follows;

Cluster 1 – Construction & Landscaping is the 1st most common venue, this may suit someone who has a career in this industry or perhaps suggests new developments in the area.

Cluster 2 – This is the largest cluster. The most common venues would appear to suit active individuals with Athletics and Sports, Parks, Sports Clubs and Golf course as the common venues here.

Cluster 3 – This cluster appears to suit a foodie however weight loss centres are ironically the 2nd most common venue.

Cluster 4 – Food venues are very popular in this cluster, with Forests as the 7th most common venue this distinguishes Cluster 4 from the others. This may suit individuals who enjoy nature and the outdoors rather than the Belfast City lifestyle.

Cluster 5 – This is another large cluster. What stood out here was that Grocery Stores appeared to be the 1st most common venue which would be convenient to have locally for a busy family lifestyle.

Conclusion section where you conclude the report.

In conclusion reviewing the common areas has told me more rather than just looking at the cluster on the map. The clustering appears to have worked. This may assist the audience to purchase a home in a cluster that suits their needs.