Task1_Exploratory_Data_Analysis

1. Load the transaction dataset below into an analysis tool of your choice (Excel, R, SAS, Tableau, or similar)
2. Start by doing some basic checks – are there any data issues? Does the data need to be cleaned?
3. Gather some interesting overall insights about the data. For example -- what is the average transaction amount? How many transactions do customers make each month, on average?
4. Segment the dataset by transaction date and time. Visualise transaction volume and spending over the course of an average day or week. Consider the effect of any outliers that may distort your analysis.
5. For a challenge – what insights can you draw from the location information provided in the dataset?
6. Put together 2-3 slides summarising your most interesting findings to ANZ management.

In [1]:

```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

In [2]:

```
df = pd.read_excel("ANZ synthesised transaction dataset.xlsx")
df.head(10)
```

Out[2]:

merchant_suburb	merchant_state	extraction	amount	transactic
Ashmore	QLD	2018-08-01T01:01:15.000+0000	16.25	a623070bfead4541a6b0fff8a09e
Sydney	NSW	2018-08-01T01:13:45.000+0000	14.19	13270a2a902145da9db4c951e04b
Sydney	NSW	2018-08-01T01:26:15.000+0000	6.42	feb79e7ecd7048a5a36ec889d1a9
Buderim	QLD	2018-08-01T01:38:45.000+0000	40.90	2698170da3704fd981b15e64a006
Mermaid Beach	QLD	2018-08-01T01:51:15.000+0000	3.25	329adf79878c4cf0aeb4188b4691
NaN	NaN	2018-08-01T02:00:00.000+0000	163.00	1005b48a6eda4ffd85e9b649dc94
Kalkallo	VIC	2018-08-01T02:23:04.000+0000	61.06	b79ca208099c4c28aa5dae966096
Melbourne	VIC	2018-08-01T04:11:25.000+0000	15.61	e1c4a50d6a0549cbb3710a62a2fa
Yokine	WA	2018-08-01T04:40:00.000+0000	19.25	799e39eb2c1b411185424b0f2cd1
NaN	NaN	2018-08-01T06:00:00.000+0000	21.00	798a77869014441b840a7a8a2340

In [3]:

```
df.shape
```

Out[3]:

```
(12043, 23)
```

In [4]:

```
df.duplicated().sum()
```

Out[4]:

```
0
```

In [37]:

```
max(df['date']) - min(df['date'])
```

Out[37]:

```
Timedelta('91 days 00:00:00')
```

In [5]:

```
df.isnull().sum()
```

Out[5]:

```
status                   0
card_present_flag     4326
bpay_biller_code     11158
account                  0
currency                 0
long_lat                 0
txn_description          0
merchant_id           4326
merchant_code        11160
first_name               0
balance                  0
date                     0
gender                   0
age                      0
merchant_suburb       4326
merchant_state        4326
extraction               0
amount                   0
transaction_id           0
country                  0
customer_id              0
merchant_long_lat     4326
movement                 0
dtype: int64
```

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 12043 entries, 0 to 12042
Data columns (total 23 columns):
status               12043 non-null object
card_present_flag    7717 non-null float64
bpay_biller_code     885 non-null object
account              12043 non-null object
currency             12043 non-null object
long_lat             12043 non-null object
txn_description      12043 non-null object
merchant_id          7717 non-null object
merchant_code        883 non-null float64
first_name           12043 non-null object
balance              12043 non-null float64
date                 12043 non-null datetime64[ns]
gender               12043 non-null object
age                  12043 non-null int64
merchant_suburb      7717 non-null object
merchant_state       7717 non-null object
extraction           12043 non-null object
amount               12043 non-null float64
transaction_id       12043 non-null object
country              12043 non-null object
customer_id          12043 non-null object
merchant_long_lat    7717 non-null object
movement             12043 non-null object
dtypes: datetime64[ns](1), float64(4), int64(1), object(17)
memory usage: 2.1+ MB
```

In [7]:

```
df.columns
```

Out[7]:

```
Index(['status', 'card_present_flag', 'bpay_biller_code', 'account',
       'currency', 'long_lat', 'txn_description', 'merchant_id',
       'merchant_code', 'first_name', 'balance', 'date', 'gender', 'age',
       'merchant_suburb', 'merchant_state', 'extraction', 'amount',
       'transaction_id', 'country', 'customer_id', 'merchant_long_lat',
       'movement'],
      dtype='object')
```

In [8]:

```
df.bpay_biller_code[~df.bpay_biller_code.isnull()][0:10]
# bpay_biller_code column has more null values and remaining are zero
```

Out[8]:

```
50    0
61    0
64    0
68    0
70    0
72    0
90    0
92    0
93    0
97    0
Name: bpay_biller_code, dtype: object
```

In [9]:

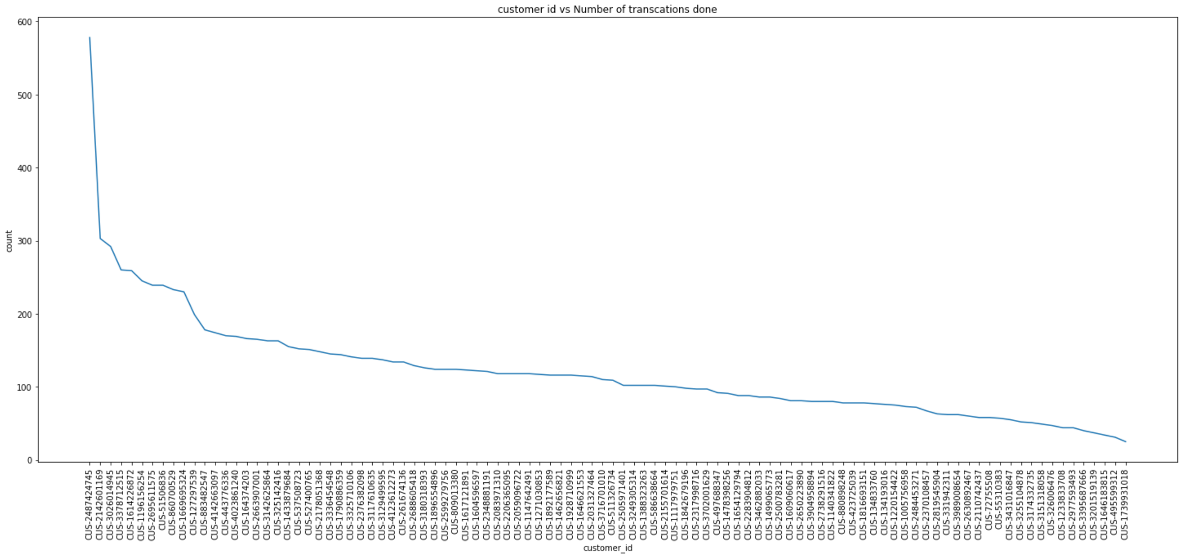
```
df = df.drop(["bpay_biller_code", "currency", "first_name", "transaction_id", "country

df.head()
```

Out[9]:

	status	card_present_flag	account	long_lat	txn_description	merchant_id	merchant
0	authorized	1.0	ACC-1598451071	153.41 -27.95	POS	81c48296-73be-44a7-befa-d053f48ce7cd	
1	authorized	0.0	ACC-1598451071	153.41 -27.95	SALES-POS	830a451c-316e-4a6a-bf25-e37caedca49e	
2	authorized	1.0	ACC-1222300524	151.23 -33.94	POS	835c231d-8cdf-4e96-859d-e9d571760cf0	
3	authorized	1.0	ACC-1037050564	153.10 -27.66	SALES-POS	48514682-c78a-4a88-b0da-2d6302e64673	
4	authorized	1.0	ACC-1598451071	153.41 -27.95	SALES-POS	b4e02c10-0852-4273-b8fd-7b3395e32eb0	

In [10]:

```
fn = df['customer_id'].value_counts()
fig, ax= plt.subplots(figsize=(25,10))
ax.plot(fn)
ax.set_title('customer id vs Number of transcations done')
ax.set_xticklabels(fn.index, rotation=90)
ax.set_xlabel('customer_id')
ax.set_ylabel('count')
plt.show()
plt.savefig('customer id vs Number of transcations done.png')
```



In [11]:

```
df.txn_description.value_counts()
```

Out[11]:

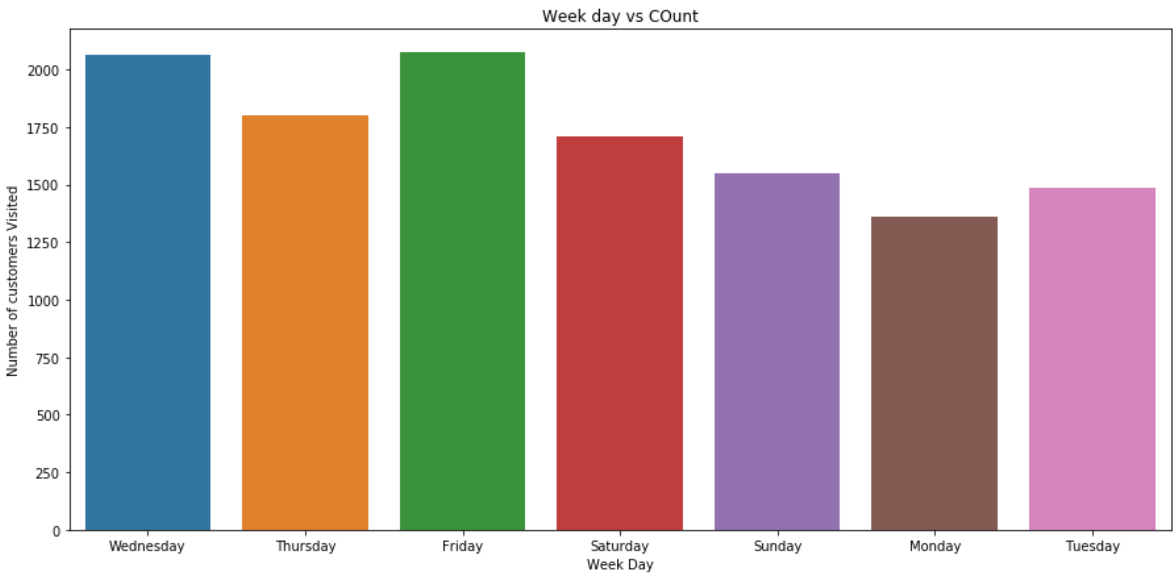
```
SALES-POS      3934
POS            3783
PAYMENT        2600
PAY/SALARY      883
INTER BANK      742
PHONE BANK      101
Name: txn_description, dtype: int64
```

In [12]:

```
df['year'] = [i.year for i in df['date']]
df['month'] = [i.month for i in df['date']]
df['day'] = [i.day_name() for i in df['date']]
```

In [13]:

```
day_count = df['day'].value_counts()
plt.figure(figsize=(15,7))
sns.countplot(df['day'])
plt.xlabel('Week Day')
plt.ylabel('Number of customers Visited')
plt.title('Week day vs Count')
plt.show()
plt.savefig('Week day vs Count.png')
```



In [14]:

```
df['day'].value_counts()
```

Out[14]:

```
Friday       2073
Wednesday    2063
Thursday     1801
Saturday     1709
Sunday       1550
Tuesday      1487
Monday       1360
Name: day, dtype: int64
```

In [15]:

```
df[['year','month','day']].head()
```

Out[15]:

	year	month	day
0	2018	8	Wednesday
1	2018	8	Wednesday
2	2018	8	Wednesday
3	2018	8	Wednesday
4	2018	8	Wednesday

In [16]:

```
df.groupby(['month', 'year','day']).mean().reset_index()
```

6	8	2018	Wednesday	0.775982	0.0	9290.821519	29.776371	196.750858
7	9	2018	Friday	0.783981	0.0	14471.007666	30.704791	245.075703
8	9	2018	Monday	0.773333	0.0	14740.961529	29.680000	359.325506
9	9	2018	Saturday	0.777143	NaN	16535.612980	30.429652	58.732345
10	9	2018	Sunday	0.810304	NaN	12888.302959	29.751701	53.028690
11	9	2018	Thursday	0.819892	0.0	17647.908854	31.682488	194.770573
12	9	2018	Tuesday	0.796491	0.0	13065.228354	31.306584	215.111749
13	9	2018	Wednesday	0.833803	0.0	13182.370235	30.033613	211.295479
14	10	2018	Friday	0.797980	0.0	17950.319168	31.527473	277.389309
15	10	2018	Monday	0.784983	0.0	17995.263092	29.568702	383.109351
16	10	2018	Saturday	0.795620	NaN	19359.085414	31.501880	52.575677
17	10	2018	Sunday	0.785901	NaN	16683.689017	29.612717	63.819191
18	10	2018	Thursday	0.808989	0.0	19607.663670	31.612795	178.732744

In [17]:

```
df.describe(include='all')
```

Out[17]:

	status	card_present_flag	account	long_lat	txn_description	merchant_id	merchant_code
count	12043	7717.000000	12043	12043	12043	7717	883.0
unique	2	NaN	100	100	6	5725	NaN
top	authorized	NaN	ACC-1598451071	153.41 -27.95	SALES-POS	106e1272-44ab-4dcb-a438-dd98e0071e51	NaN
freq	7717	NaN	578	578	3934	14	NaN
first	NaN	NaN	NaN	NaN	NaN	NaN	NaN
last	NaN	NaN	NaN	NaN	NaN	NaN	NaN

In [18]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 12043 entries, 0 to 12042
Data columns (total 21 columns):
status                   12043 non-null object
card_present_flag        7717 non-null float64
account                  12043 non-null object
long_lat                 12043 non-null object
txn_description          12043 non-null object
merchant_id              7717 non-null object
merchant_code            883 non-null float64
balance                  12043 non-null float64
date                     12043 non-null datetime64[ns]
gender                   12043 non-null object
age                      12043 non-null int64
merchant_suburb          7717 non-null object
merchant_state           7717 non-null object
extraction               12043 non-null object
amount                   12043 non-null float64
customer_id              12043 non-null object
merchant_long_lat        7717 non-null object
movement                 12043 non-null object
year                     12043 non-null int64
month                    12043 non-null int64
day                      12043 non-null object
dtypes: datetime64[ns](1), float64(4), int64(3), object(13)
memory usage: 1.9+ MB
```

In [19]:

```
df.shape

```

Out[19]:

```
(12043, 21)
```

In [20]:

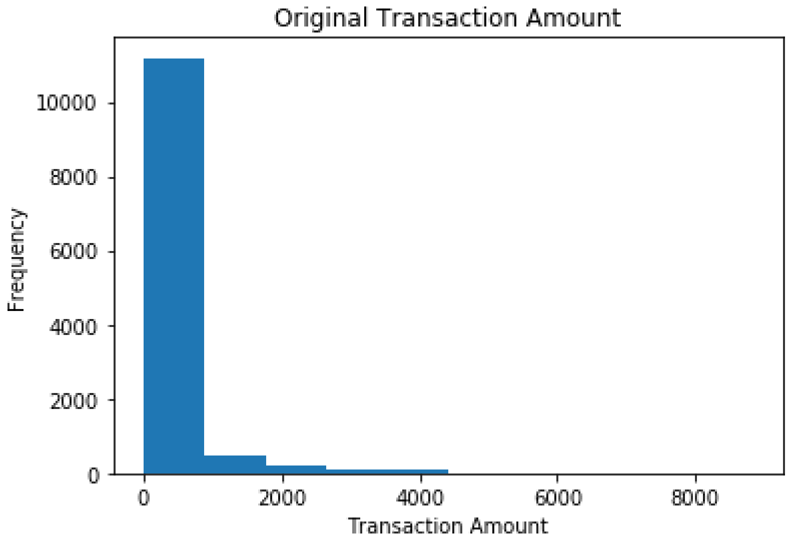
```
df['status'].value_counts()
```

Out[20]:

```
authorized    7717
posted        4326
Name: status, dtype: int64
```

In [21]:

```
plt.hist(df['amount'])
plt.xlabel('Average trainsaction')
plt.title('Original Transaction Amount')
plt.xlabel('Transaction Amount')
plt.ylabel('Frequency')
plt.show()
```



In [22]:

```
Q1 = df.quantile(0.25)
Q3 = df.quantile(0.75)

IQR = Q3 - Q1

print(IQR)
```

```
card_present_flag       0.000
merchant_code           0.000
balance              9307.360
age                    16.000
amount                 37.655
year                    0.000
month                   2.000
dtype: float64
```

In [23]:

```
IQR.index
```

Out[23]:

```
Index(['card_present_flag', 'merchant_code', 'balance', 'age', 'amount',
       'year', 'month'],
      dtype='object')
```

In [24]:

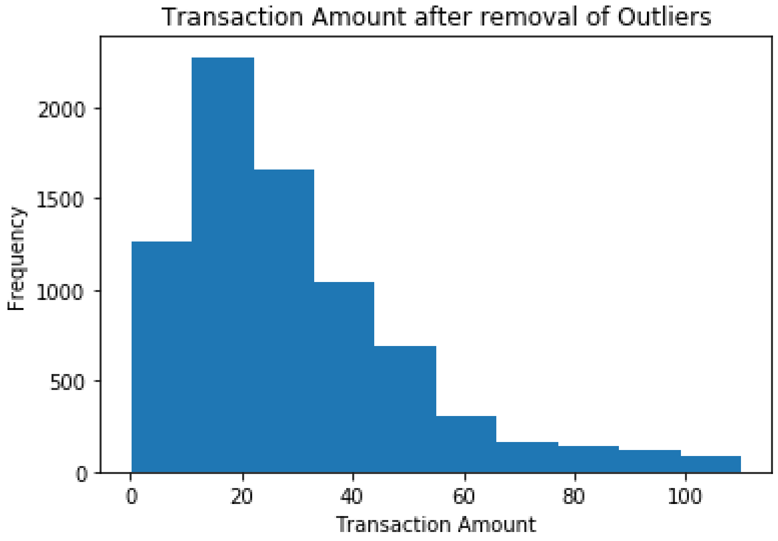
```
rdf = df[['card_present_flag', 'merchant_code', 'balance', 'age', 'amount', 'month', '
outliers_removed_data = rdf[~ ((rdf < (Q1 - 1.5 * IQR)) \
                                     | (rdf > (Q3 + 1.5 * IQR))).any(axis=1)]

outliers_removed_data.shape
```

Out[24]:

```
(7730, 8)
```

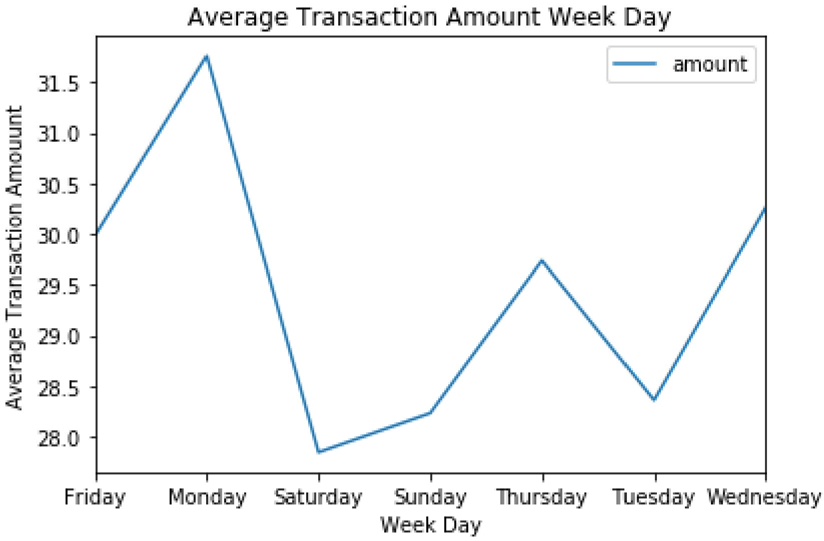
In [26]:

```python
plt.hist(outliers_removed_data['amount'])
plt.title('Transaction Amount after removal of Outliers')
plt.xlabel('Transaction Amount')
plt.ylabel('Frequency')
plt.show()
```



In [35]:

```python
outliers_removed_data.groupby(['day']).mean().reset_index().plot(kind = 'line',x = 'da
plt.title('Average Transaction Amount Week Day')
plt.xlabel('Week Day')
plt.ylabel('Average Transaction Amouunt')
plt.show()
plt.savefig('Average Transaction Amount Week Day.png')
```



In [27]:

```
customer_locations = [loc.split() for loc in df['long_lat'].unique()]
customer_id = df['customer_id']
customer_locations[0], customer_id[0]
```

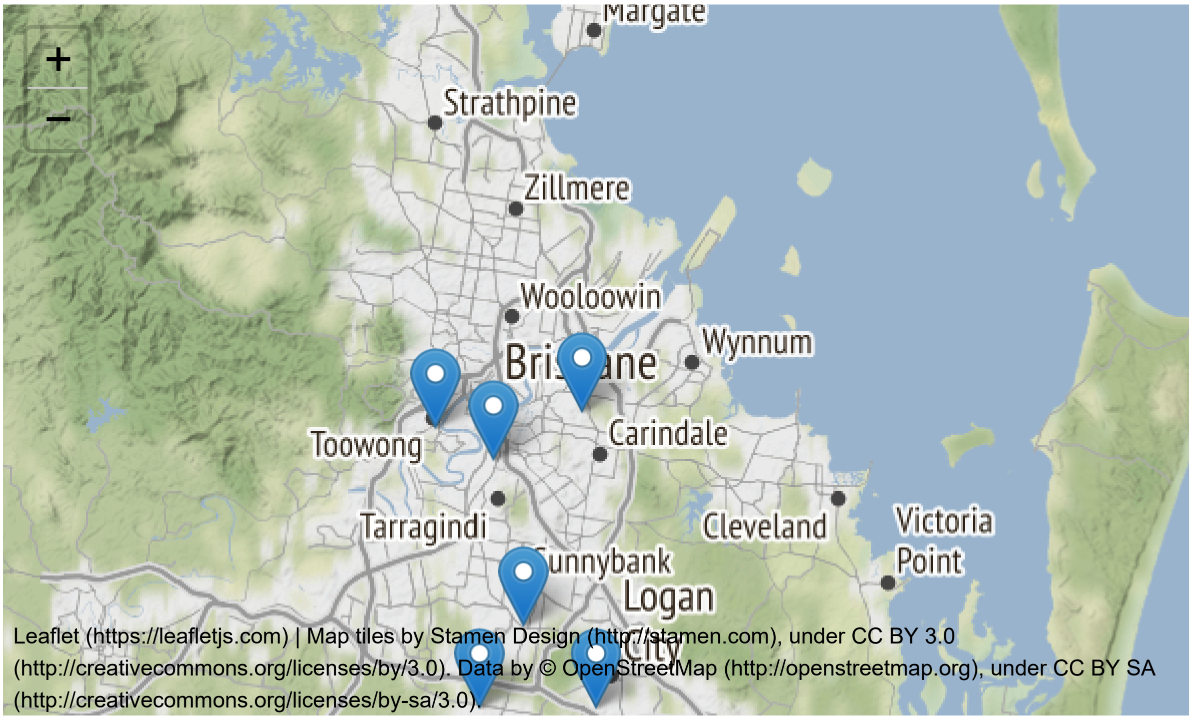
Out[27]:

```
(['153.41', '-27.95'], 'CUS-2487424745')
```

In [33]:

```
import folium
map_result = folium.Map(location=['-27.95', '153.41'], tiles='Stamen Terrain', zoom_st

for loc in range(len(customer_locations)):
    customer_locations[loc].reverse()
    folium.Marker(customer_locations[loc], popup = customer_id[loc]).add_to(map_result

map_result
```

Out[33]:



Leaflet (https://leafletjs.com) | Map tiles by Stamen Design (http://stamen.com), under CC BY 3.0 (http://creativecommons.org/licenses/by/3.0). Data by © OpenStreetMap (http://openstreetmap.org), under CC BY SA (http://creativecommons.org/licenses/by-sa/3.0).

In [34]:

```
map_result.save('Module1_Customer_Locations.html')
```