Sales Analysis Project

As a data scientist, you must perform the following steps on the enclosed data:

1. Data wrangling

2. Data analysis

3. Data visualization

4. Report generation

In [162…

```
# Header File import

import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [163…

```
# Read the data file in python Dataframe
df = pd.read_csv('AusApparalSales4thQrt2020.csv')
```

In [164…

```
# Display Dataframe to perform further operations
df
```

Out[164…

	Date	Time	State	Group	Unit	Sales
0	1-Oct-2020	Morning	WA	Kids	8	20000
1	1-Oct-2020	Morning	WA	Men	8	20000
2	1-Oct-2020	Morning	WA	Women	4	10000
3	1-Oct-2020	Morning	WA	Seniors	15	37500
4	1-Oct-2020	Afternoon	WA	Kids	3	7500
...	...	...	...	...	...	...
7555	30-Dec-2020	Afternoon	TAS	Seniors	14	35000
7556	30-Dec-2020	Evening	TAS	Kids	15	37500
7557	30-Dec-2020	Evening	TAS	Men	15	37500
7558	30-Dec-2020	Evening	TAS	Women	11	27500
7559	30-Dec-2020	Evening	TAS	Seniors	13	32500

7560 rows × 6 columns

Question 1.a. Data wrangling

a. Ensure that the data is clean and free from any missing or incorrect entries.

○ Inspect the data manually to identify missing or incorrect information using the functions isna() and notna().

In [165…

```
df.isna().sum()
```

Out[165…

```
Date      0
Time      0
State     0
Group     0
Unit      0
Sales     0
dtype: int64
```

In [166…

```
df.notna().sum()
```

Out[166…

```
Date      7560
Time      7560
State     7560
Group     7560
Unit      7560
Sales     7560
dtype: int64
```

In [167…

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7560 entries, 0 to 7559
Data columns (total 6 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   Date    7560 non-null   object
 1   Time    7560 non-null   object
 2   State   7560 non-null   object
 3   Group   7560 non-null   object
 4   Unit    7560 non-null   int64 
 5   Sales   7560 non-null   int64 
dtypes: int64(2), object(4)
memory usage: 354.5+ KB
```

Question 1.b. Based on your knowledge of data analytics, include your recommendations for treating missing and incorrect data (dropping the null values or filling them).

Ensuring that data does not contain missing or incorrect information using the functions isna() and notna()

In [168…

```
df['Date'].unique()
```

Out[168…

```
array(['1-Oct-2020', '2-Oct-2020', '3-Oct-2020', '4-Oct-2020',
       '5-Oct-2020', '6-Oct-2020', '7-Oct-2020', '8-Oct-2020',
       '9-Oct-2020', '10-Oct-2020', '11-Oct-2020', '12-Oct-2020',
       '13-Oct-2020', '14-Oct-2020', '15-Oct-2020', '16-Oct-2020',
       '17-Oct-2020', '18-Oct-2020', '19-Oct-2020', '20-Oct-2020',
       '21-Oct-2020', '22-Oct-2020', '23-Oct-2020', '24-Oct-2020',
       '25-Oct-2020', '26-Oct-2020', '27-Oct-2020', '28-Oct-2020',
       '29-Oct-2020', '30-Oct-2020', '1-Nov-2020', '2-Nov-2020',
       '3-Nov-2020', '4-Nov-2020', '5-Nov-2020', '6-Nov-2020',
       '7-Nov-2020', '8-Nov-2020', '9-Nov-2020', '10-Nov-2020',
       '11-Nov-2020', '12-Nov-2020', '13-Nov-2020', '14-Nov-2020',
       '15-Nov-2020', '16-Nov-2020', '17-Nov-2020', '18-Nov-2020',
       '19-Nov-2020', '20-Nov-2020', '21-Nov-2020', '22-Nov-2020',
       '23-Nov-2020', '24-Nov-2020', '25-Nov-2020', '26-Nov-2020',
       '27-Nov-2020', '28-Nov-2020', '29-Nov-2020', '30-Nov-2020',
       '1-Dec-2020', '2-Dec-2020', '3-Dec-2020', '4-Dec-2020',
       '5-Dec-2020', '6-Dec-2020', '7-Dec-2020', '8-Dec-2020',
       '9-Dec-2020', '10-Dec-2020', '11-Dec-2020', '12-Dec-2020',
       '13-Dec-2020', '14-Dec-2020', '15-Dec-2020', '16-Dec-2020',
       '17-Dec-2020', '18-Dec-2020', '19-Dec-2020', '20-Dec-2020',
       '21-Dec-2020', '22-Dec-2020', '23-Dec-2020', '24-Dec-2020',
       '25-Dec-2020', '26-Dec-2020', '27-Dec-2020', '28-Dec-2020',
       '29-Dec-2020', '30-Dec-2020'], dtype=object)
```

Here we can see that 2 dates are missing:

31-Oct-2020 & 31-Dec-2020

Ideally we should ask this missing data from customer for accurate reports

In [ ]:

```
```

In [ ]:

```
```

Question 1.c. Choose a suitable data wrangling technique—either data standardization or normalization. Execute the preferred normalization method and present the resulting data. (Normalization is the preferred approach for this problem.)

In [169…

```python
# copy the data
df_min_max_scaled = df.copy()

# Get numeric column names
numeric_columns = df.select_dtypes(include=["number"]).columns.tolist()
```

In [170…

```python
for column in numeric_columns:
    min_val = df[column].min()
    max_val = df[column].max()
    df[column + '_norm'] = (df[column] - min_val) / (max_val - min_val)
```

In [171…

```python
df
```

Out[171…

	Date	Time	State	Group	Unit	Sales	Unit_norm	Sales_norm
0	1-Oct-2020	Morning	WA	Kids	8	20000	0.095238	0.095238
1	1-Oct-2020	Morning	WA	Men	8	20000	0.095238	0.095238
2	1-Oct-2020	Morning	WA	Women	4	10000	0.031746	0.031746
3	1-Oct-2020	Morning	WA	Seniors	15	37500	0.206349	0.206349
4	1-Oct-2020	Afternoon	WA	Kids	3	7500	0.015873	0.015873
...	...	...	...	...	...	...	...	...
7555	30-Dec-2020	Afternoon	TAS	Seniors	14	35000	0.190476	0.190476
7556	30-Dec-2020	Evening	TAS	Kids	15	37500	0.206349	0.206349
7557	30-Dec-2020	Evening	TAS	Men	15	37500	0.206349	0.206349
7558	30-Dec-2020	Evening	TAS	Women	11	27500	0.142857	0.142857
7559	30-Dec-2020	Evening	TAS	Seniors	13	32500	0.174603	0.174603

7560 rows × 8 columns

In [172…

```
# 1.b. Based on your knowledge of data analytics, include your recommendations f
# Remove any leading & traiing space in dataframe

for i in ['Time', 'State', 'Group']:
    df[i] = df[i].str.strip()
```

In [173…

```
# 1.b. Based on your knowledge of data analytics, include your recommendations f
# Remove any leading & traiing space in dataframe
df['Time'] = df['Time'].str.strip()
df['State'] = df['State'].str.strip()
df['Group'] = df['Group'].str.strip()
```

In [174…

```
df['Date_f'] = pd.to_datetime(df['Date'], format='%d-%b-%Y')
# Extract the month and year for grouping
df['Month'] = df['Date_f'].dt.to_period('M')  # Extract Month-Year as a Period o
# Group by Month and calculate total Sales
df_month = df.groupby(['Month']).mean(numeric_only = True)
print(df_month)
```

```
              Unit         Sales  Unit_norm  Sales_norm
Month
2020-10  18.141270  45353.174603   0.256211    0.256211
2020-11  14.394048  35985.119048   0.196731    0.196731
2020-12  21.480952  53702.380952   0.309221    0.309221
```

This shows December have highest sales, followed by October & then November

In [ ]:

In [175…

```
groups_df = df.groupby(['Group', 'Time', 'State']).agg({"Unit": "sum", "Sales":
```

In [176…

```
groups_df[groups_df['Group'] == 'Kids']
```

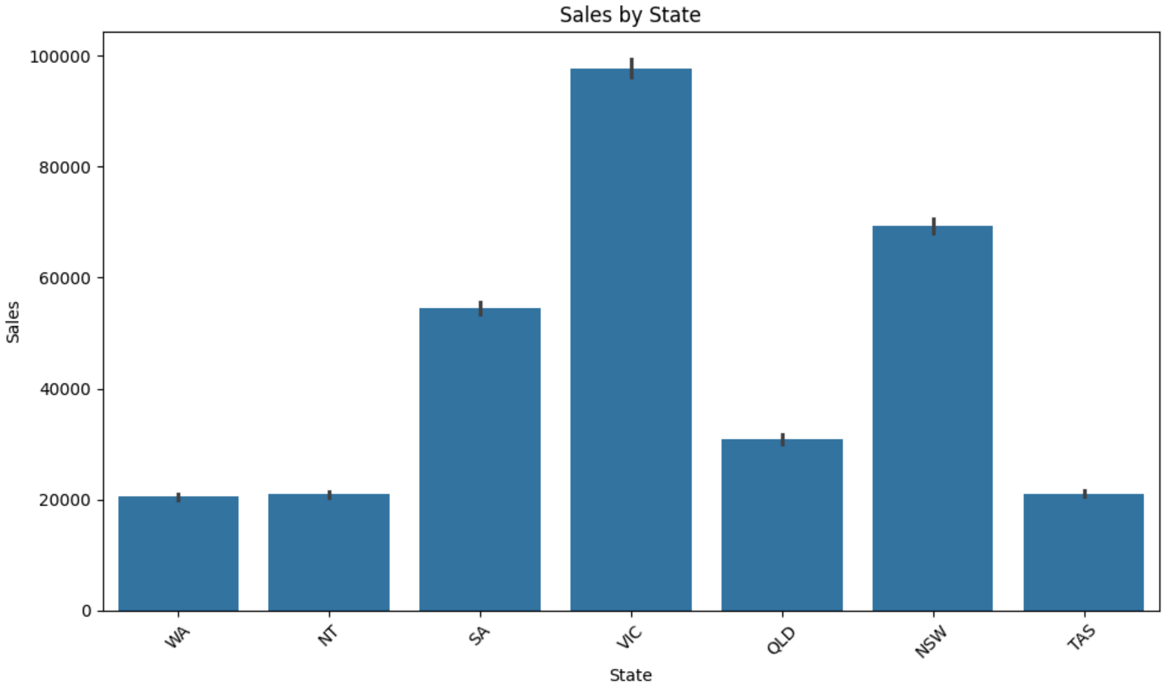
Out[176…

	Group	Time	State	Unit	Sales
0	Kids	Afternoon	NSW	2475	6187500
1	Kids	Afternoon	NT	752	1880000
2	Kids	Afternoon	QLD	1144	2860000
3	Kids	Afternoon	SA	1988	4970000
4	Kids	Afternoon	TAS	749	1872500
5	Kids	Afternoon	VIC	3515	8787500
6	Kids	Afternoon	WA	778	1945000
7	Kids	Evening	NSW	2453	6132500
8	Kids	Evening	NT	789	1972500
9	Kids	Evening	QLD	1086	2715000
10	Kids	Evening	SA	1919	4797500
11	Kids	Evening	TAS	790	1975000
12	Kids	Evening	VIC	3449	8622500
13	Kids	Evening	WA	735	1837500
14	Kids	Morning	NSW	2507	6267500
15	Kids	Morning	NT	739	1847500
16	Kids	Morning	QLD	1174	2935000
17	Kids	Morning	SA	1899	4747500
18	Kids	Morning	TAS	771	1927500
19	Kids	Morning	VIC	3580	8950000
20	Kids	Morning	WA	737	1842500

1.d: Share your insights regarding the application of the GroupBy() function for either data chunking or merging, and offer a recommendation based on your analysis.

In [177…

```
# Sales by State
plt.figure(figsize=(10, 6))
sns.barplot(data=df, x='State', y='Sales')
plt.title('Sales by State')
plt.xlabel('State')
plt.ylabel('Sales')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



THis shows that VIC state has good sales as compared to WA, NT and TAS state.

SUggestive measures:

> We can start promotional offers

> We can Run targeted promotions, focus on inventory alignment, and adjust product offerings based on sales patterns

> We can increase Marketing and Advertisment efforts in states with lower sales

> We can have additional member only discounts & sending regular email promotions et al.

In [ ]:

```

```

Question 2

Question 2.a. Perform descriptive statistical analysis on the data in the Sales and Unit columns. Utilize techniques such as mean, median, mode, and standard deviation for this analysis.

In [178…

```
df.describe()
```

Out[178…

	Unit	Sales	Unit_norm	Sales_norm	Date_f
count	7560.000000	7560.000000	7560.000000	7560.000000	7560
mean	18.005423	45013.558201	0.254054	0.254054	2020-11-15 04:00:00.000000256
min	2.000000	5000.000000	0.000000	0.000000	2020-10-01 00:00:00
25%	8.000000	20000.000000	0.095238	0.095238	2020-10-23 00:00:00
50%	14.000000	35000.000000	0.190476	0.190476	2020-11-15 12:00:00
75%	26.000000	65000.000000	0.380952	0.380952	2020-12-08 00:00:00
max	65.000000	162500.000000	1.000000	1.000000	2020-12-30 00:00:00
std	12.901403	32253.506944	0.204784	0.204784	NaN

In [179…

```
df['Unit'].mode()
```

Out[179…

```
0    9
Name: Unit, dtype: int64
```

In [180…

```
df['Sales'].mode()
```

Out[180…

```
0    22500
Name: Sales, dtype: int64
```

2.a : Perform descriptive statistical analysis on the data in the Sales and Unit columns. Utilize techniques such as mean, median, mode, and standard deviation for this analysis.

In [181…

```
analysis_df = df.groupby(['Time', 'State', 'Group']).agg({'Sales' : ['mean','med
      'Unit' : ['mean','median','std']})
analysis_df
```

Out[181…

			Sales					
			mean	median	std	mean	median	
Time	State	Group						
Afternoon	NSW	Kids	68750.000000	67500.0	20619.785687	27.500000	27.0	8.2
		Men	72361.111111	73750.0	18896.380335	28.944444	29.5	7.5
		Seniors	66500.000000	65000.0	21413.531373	26.600000	26.0	8.5
		Women	71388.888889	75000.0	20557.917332	28.555556	30.0	8.2
	NT	Kids	20888.888889	20000.0	8989.000075	8.355556	8.0	3.5
...	...	...	...	...	...	...	...	
Morning	VIC	Women	97750.000000	93750.0	23329.136193	39.100000	37.5	9.3
	WA	Kids	20472.222222	20000.0	9338.322971	8.188889	8.0	3.7
		Men	22305.555556	22500.0	9378.344181	8.922222	9.0	3.7
		Seniors	21666.666667	20000.0	9642.485576	8.666667	8.0	3.8
		Women	19638.888889	17500.0	9252.703151	7.855556	7.0	3.7

84 rows × 6 columns

Sales: Will provide an understanding of the average sales amount, the spread of sales values (through standard deviation).

Unit: Will give insights into how many units are typically sold (mean), how consistent the number of units sold is (standard deviation).

In [182…

```
# Unit: The most common sales figure (mode)
# Group by 'Time', 'State', 'Group' and calculate the mode for each group
mode_unit = df.groupby(['Time', 'State', 'Group'])['Unit'].apply(lambda x: x.mod
mode_unit
```

Out[182…

```
Time       State  Group  
Afternoon  NSW    Kids       17
                  Men        25
                  Seniors    17
                  Women      33
           NT     Kids        5
                             ..
Morning    VIC    Women      37
           WA     Kids        6
                  Men         6
                  Seniors     9
                  Women       6
Name: Unit, Length: 84, dtype: int64
```

In [183…

```
# Sales: Which unit count is most frequent (mode)
# Group by 'Time', 'State', 'Group' and calculate the mode for each group
mode_sales = df.groupby(['Time', 'State', 'Group'])['Sales'].apply(lambda x: x.m
mode_sales
```

Out[183…

```
Time       State  Group
Afternoon  NSW    Kids         42500
                  Men          62500
                  Seniors      42500
                  Women        82500
           NT     Kids         12500
                                ...
Morning    VIC    Women        92500
           WA     Kids         15000
                  Men          15000
                  Seniors      22500
                  Women        15000
Name: Sales, Length: 84, dtype: int64
```

2.b: Identify the group with the highest sales and the group with the lowest sales based on the data provided

In [184…

```
# Group by 'Group' and calculate the total sales for each group
group_sales = df.groupby('Group')['Sales'].sum()

# Find the group with the highest and lowest sales
highest_sales_group = group_sales.idxmax()
highest_sales_value = group_sales.max()

lowest_sales_group = group_sales.idxmin()
lowest_sales_value = group_sales.min()
```

In [185…

```
# Display the result
print(f"Group with highest sales: {highest_sales_group} with Sales: {highest_sal
print(f"Group with lowest sales: {lowest_sales_group} with Sales: {lowest_sales_
```

```
Group with highest sales: Men with Sales: 85750000
Group with lowest sales: Seniors with Sales: 84037500
```

In [ ]:

In [186…

```
# Group by 'State' and 'Group' and calculate the total sales for each group with
state_group_sales = df.groupby(['State', 'Group'])['Sales'].sum()

# For each state, find the group with the highest and lowest sales
highest_sales = state_group_sales.groupby('State').idxmax()
highest_sales_values = state_group_sales.groupby('State').max()

lowest_sales = state_group_sales.groupby('State').idxmin()
lowest_sales_values = state_group_sales.groupby('State').min()

# Combine results into a DataFrame
result = pd.DataFrame({
    'Highest_Sales_Group': highest_sales,
    'Highest_Sales_Value': highest_sales_values,
    'Lowest_Sales_Group': lowest_sales,
    'Lowest_Sales_Value': lowest_sales_values
})

# Display the result
print(result)
```

```
      Highest_Sales_Group  Highest_Sales_Value Lowest_Sales_Group  \
State
NSW          (NSW, Women)             19172500     (NSW, Seniors)
NT              (NT, Men)              5762500      (NT, Seniors)
QLD           (QLD, Kids)              8510000     (QLD, Seniors)
SA            (SA, Women)             14970000         (SA, Kids)
TAS           (TAS, Kids)              5775000       (TAS, Women)
VIC          (VIC, Women)             26482500     (VIC, Seniors)
WA              (WA, Men)              5752500        (WA, Women)

       Lowest_Sales_Value
State
NSW              18187500
NT                5465000
QLD               8190000
SA               14515000
TAS               5577500
VIC              26315000
WA                5262500
```

2.d: Generate weekly, monthly, and quarterly reports to document and present the results of the analysis conducted.

(Use suitable libraries such as NumPy, Pandas, and SciPy for performing the analysis.)

In [187…

```
df['Date_re'] = pd.to_datetime(df['Date'], format='%d-%b-%Y')

# Set 'Time' as index for resampling
df.set_index('Date_re', inplace=True)


weekly_report = df.resample('W')['Sales'].sum()
monthly_report = df.resample('ME')['Sales'].sum()
quarterly_report = df.resample('QE')['Sales'].sum()

# Display the results for each time period
print("Weekly Report:")
print(weekly_report)

print("\nMonthly Report:")
print(monthly_report)

print("\nQuarterly Report:")
print(quarterly_report)
```

```
Weekly Report:
Date_re
2020-10-04    15045000
2020-10-11    27002500
2020-10-18    26640000
2020-10-25    26815000
2020-11-01    21807500
2020-11-08    20865000
2020-11-15    21172500
2020-11-22    21112500
2020-11-29    21477500
2020-12-06    29622500
2020-12-13    31525000
2020-12-20    31655000
2020-12-27    31770000
2021-01-03    13792500
Freq: W-SUN, Name: Sales, dtype: int64

Monthly Report:
Date_re
2020-10-31    114290000
2020-11-30     90682500
2020-12-31    135330000
Freq: ME, Name: Sales, dtype: int64

Quarterly Report:
Date_re
2020-12-31    340302500
Freq: QE-DEC, Name: Sales, dtype: int64
```

In [ ]:

Question 3

3.a.1 Use suitable data visualization libraries to construct a dashboard for the head of sales and marketing. The dashboard should encompass key parameters:

> State-wise sales analysis for different demographic groups (kids, women, men, and seniors).

In [188…

```
# Group by 'State' and 'Group' and sum the 'Sales'
state_sales = df.groupby(['State', 'Group'])['Sales'].sum().reset_index()

# Pivot the data to make each 'Group' a separate column
pivot_df = state_sales.pivot_table(index='State', columns='Group', values='Sales
```

In [189…

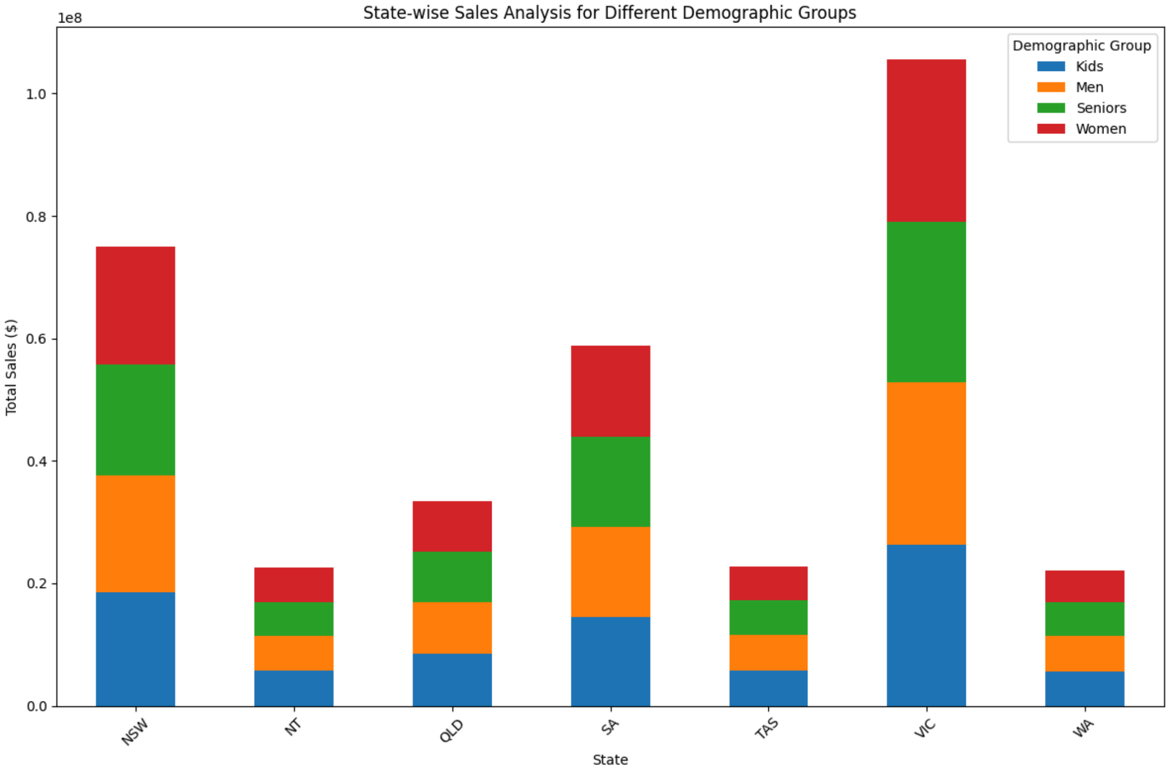
```
pivot_df
```

Out[189…

Group	State	Kids	Men	Seniors	Women
0	NSW	18587500	19022500	18187500	19172500
1	NT	5700000	5762500	5465000	5652500
2	QLD	8510000	8392500	8190000	8325000
3	SA	14515000	14655000	14717500	14970000
4	TAS	5775000	5757500	5650000	5577500
5	VIC	26360000	26407500	26315000	26482500
6	WA	5625000	5752500	5512500	5262500

In [190…

```
# Plotting the stacked bar chart
pivot_df.set_index('State').plot(kind='bar', stacked=True, figsize=(12, 8))

# Adding labels and title
plt.title('State-wise Sales Analysis for Different Demographic Groups')
plt.xlabel('State')
plt.ylabel('Total Sales ($)')
plt.legend(title='Demographic Group')
plt.xticks(rotation=45)

# Show the plot
plt.tight_layout()
plt.show()
```



3.a.2 Group-wise sales analysis (Kids, Women, Men, and Seniors) across various states.

In [191…

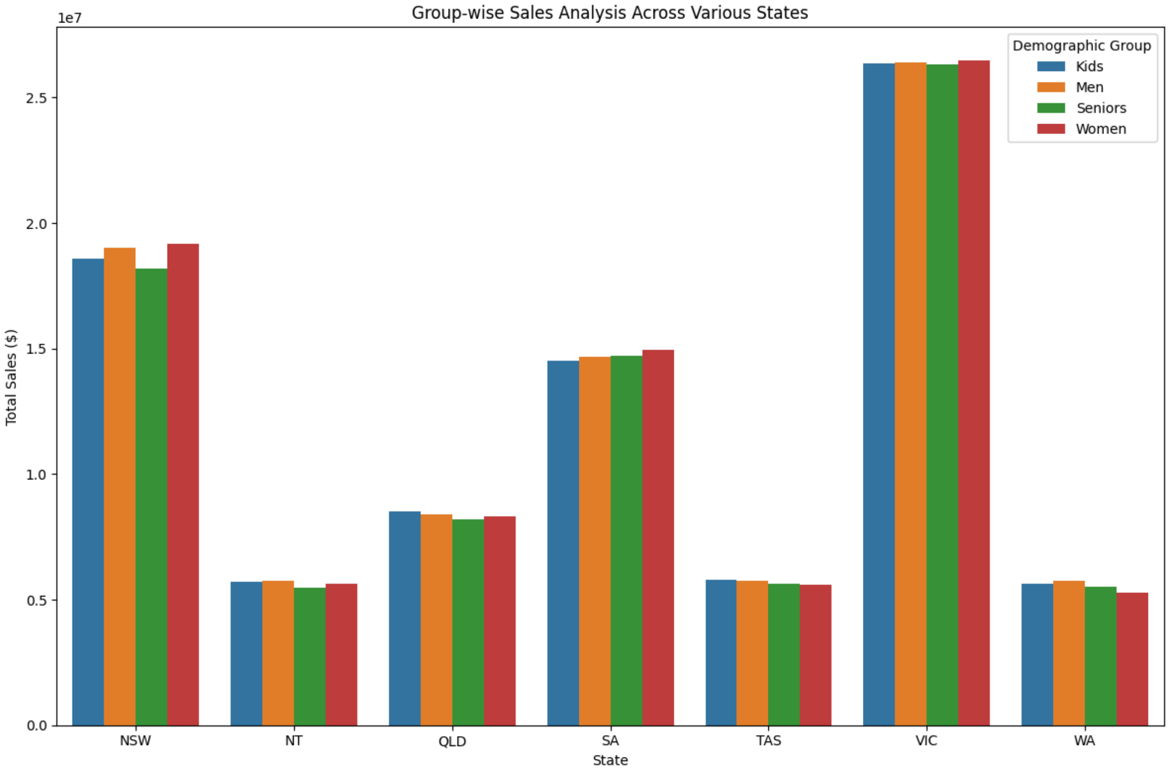
```
# Group by 'Group' and 'State', then sum the 'Sales'
group_sales = df.groupby(['Group', 'State'])['Sales'].sum().reset_index()
```

```
# Verify the grouped data
print(group_sales)
```

```
      Group State     Sales
0      Kids   NSW  18587500
1      Kids    NT   5700000
2      Kids   QLD   8510000
3      Kids    SA  14515000
4      Kids   TAS   5775000
5      Kids   VIC  26360000
6      Kids    WA   5625000
7       Men   NSW  19022500
8       Men    NT   5762500
9       Men   QLD   8392500
10      Men    SA  14655000
11      Men   TAS   5757500
12      Men   VIC  26407500
13      Men    WA   5752500
14  Seniors   NSW  18187500
15  Seniors    NT   5465000
16  Seniors   QLD   8190000
17  Seniors    SA  14717500
18  Seniors   TAS   5650000
19  Seniors   VIC  26315000
20  Seniors    WA   5512500
21    Women   NSW  19172500
22    Women    NT   5652500
23    Women   QLD   8325000
24    Women    SA  14970000
25    Women   TAS   5577500
26    Women   VIC  26482500
27    Women    WA   5262500
```

In [192…

```
# Plotting the group-wise sales analysis across various states
plt.figure(figsize=(12, 8))
sns.barplot(x='State', y='Sales', hue='Group', data=group_sales)

# Adding labels and title
plt.title('Group-wise Sales Analysis Across Various States')
plt.xlabel('State')
plt.ylabel('Total Sales ($)')
plt.legend(title='Demographic Group')

# Show the plot
plt.tight_layout()
plt.show()
```



3.1.c: Time-of-the-day analysis: Identify peak and off-peak sales periods to facilitate strategic planning for S&M teams. This information aids in designing programs like hyper-personalization and Next Best Offers to enhance sales.

In [193…

```
# Group by 'Time' and sum the 'Sales'
time_sales = df.groupby(['Time'])['Sales'].sum().reset_index()

# Sort the data by Sales to identify peak and off-peak periods
time_sales_sorted = time_sales.sort_values(by='Sales', ascending=False)
```

In [194…

```
time_sales_sorted
```

Out[194…

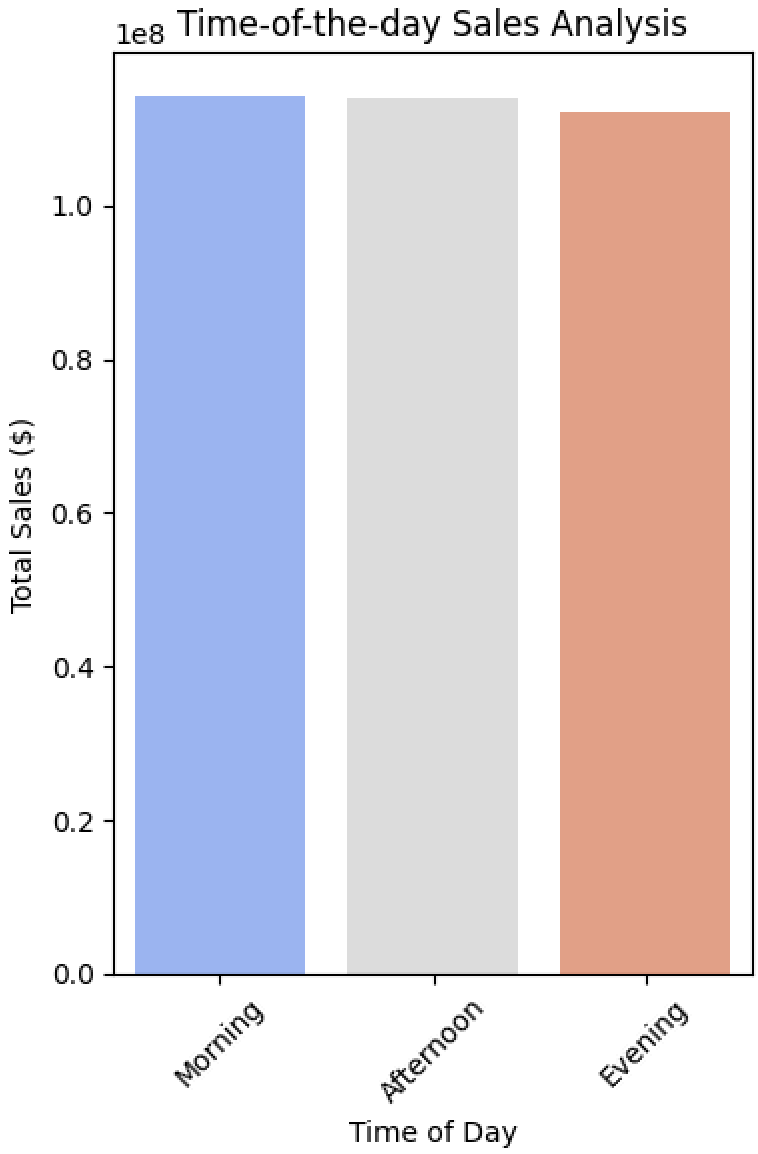
```
        Time      Sales
2    Morning  114207500
0  Afternoon  114007500
1    Evening  112087500
```

In [ ]:

```

```

In [195…

```
# Plotting the Time-of-the-day Sales Analysis
plt.figure(figsize=(4, 6))

#sns.barplot(x='Time', y='Sales', hue='Group', data=time_sales_sorted)

sns.barplot(x='Time', y='Sales', data=time_sales_sorted, hue = 'Time', palette="

# Adding labels and title
plt.title('Time-of-the-day Sales Analysis')
plt.xlabel('Time of Day')
plt.ylabel('Total Sales ($)')
plt.xticks(rotation=45)

# Show the plot
plt.tight_layout()
plt.show()

# Display peak and off-peak times
peak_period = time_sales_sorted.iloc[0]
off_peak_period = time_sales_sorted.iloc[-1]

print(f"Peak Sales Period: {peak_period['Time']} with Sales: ${peak_period['Sale
print(f"Off-Peak Sales Period: {off_peak_period['Time']} with Sales: ${off_peak_
```



```
Peak Sales Period: Morning with Sales: $114207500
Off-Peak Sales Period: Evening with Sales: $112087500
```

In [ ]:

3.b. : Ensure the visualization is clear and accessible for effective decision-making by the head of sales and marketing (S&M). The dashboard must contain daily, weekly, monthly, and quarterly charts.

In [196…

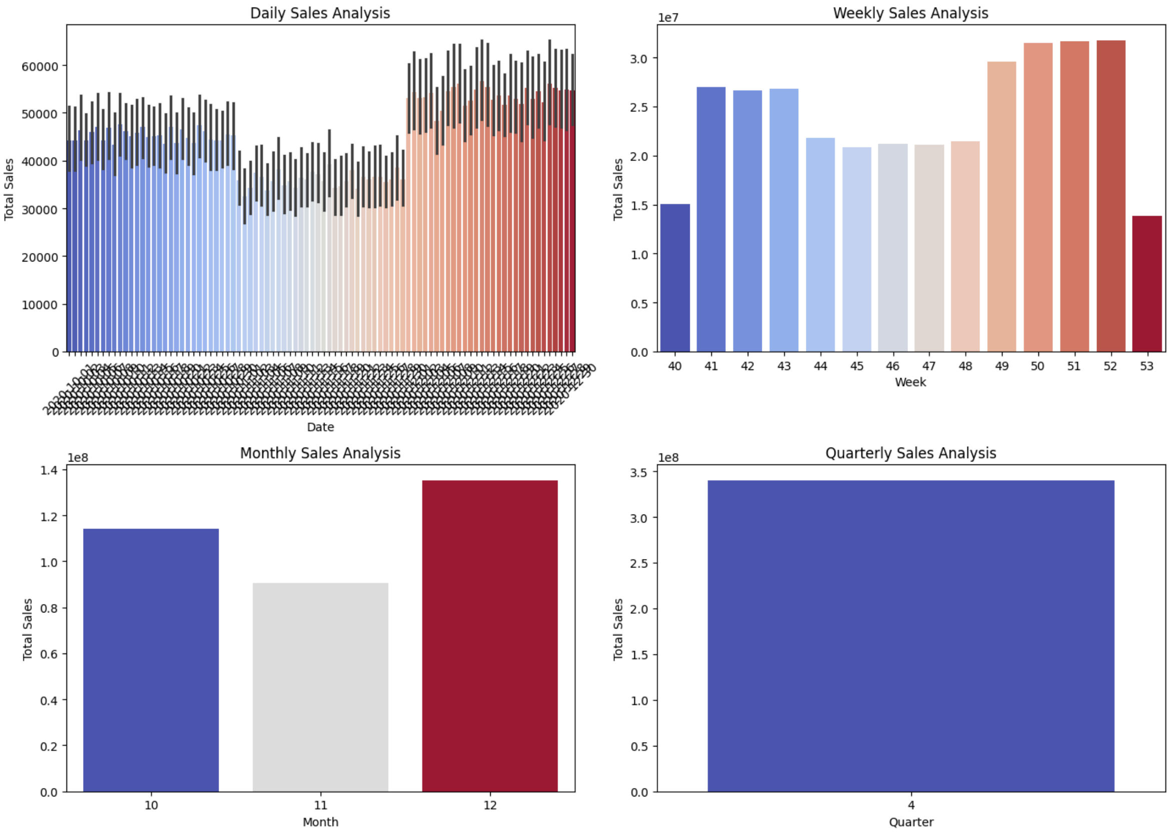
```
from matplotlib.dates import DateFormatter
```

In [197…

```
# Convert 'Date' to datetime, specifying the correct format
df['Date'] = pd.to_datetime(df['Date'], format='%d-%b-%Y')

# Add derived columns
df['Week'] = df['Date'].dt.isocalendar().week.astype(int)  # Convert to int
df['Month'] = df['Date'].dt.month
df['Quarter'] = df['Date'].dt.quarter
```

In [198…

```
# Set up the figure for subplots
fig, axs = plt.subplots(2, 2, figsize=(14, 10))

# Daily Sales plot
sns.barplot(x='Date', y='Sales', data=df, ax=axs[0, 0], palette='coolwarm', hue=
axs[0, 0].set_title('Daily Sales Analysis')
axs[0, 0].set_xlabel('Date')
axs[0, 0].set_ylabel('Total Sales')
axs[0, 0].tick_params(axis='x', rotation=45)

# Weekly Sales plot
weekly_sales = df.groupby('Week')['Sales'].sum().reset_index()
sns.barplot(x='Week', y='Sales', data=weekly_sales, ax=axs[0, 1], palette='coolw
axs[0, 1].set_title('Weekly Sales Analysis')
axs[0, 1].set_xlabel('Week')
axs[0, 1].set_ylabel('Total Sales')

# Monthly Sales plot
monthly_sales = df.groupby('Month')['Sales'].sum().reset_index()
sns.barplot(x='Month', y='Sales', data=monthly_sales, ax=axs[1, 0], palette='coo
axs[1, 0].set_title('Monthly Sales Analysis')
axs[1, 0].set_xlabel('Month')
axs[1, 0].set_ylabel('Total Sales')

# Quarterly Sales plot
quarterly_sales = df.groupby('Quarter')['Sales'].sum().reset_index()
sns.barplot(x='Quarter', y='Sales', data=quarterly_sales, ax=axs[1, 1], palette=
axs[1, 1].set_title('Quarterly Sales Analysis')
axs[1, 1].set_xlabel('Quarter')
axs[1, 1].set_ylabel('Total Sales')

# Adjust layout
plt.tight_layout()
plt.show()
```



```
In [ ]:
```

3.c. : Include your recommendation and indicate why you are choosing the recommended visualization package.

I Prefer to use Seaborn as it provides good support & custmizations:

Seaborn provides a high-level interface to create attractive and informative statistical graphics. It integrates seamlessly with pandas DataFrames and handles categorical and continuous data in a simple manner.

Seaborn allows customization of colors, themes, and other plot settings, ensuring the visuals align with any branding or presentation needs.

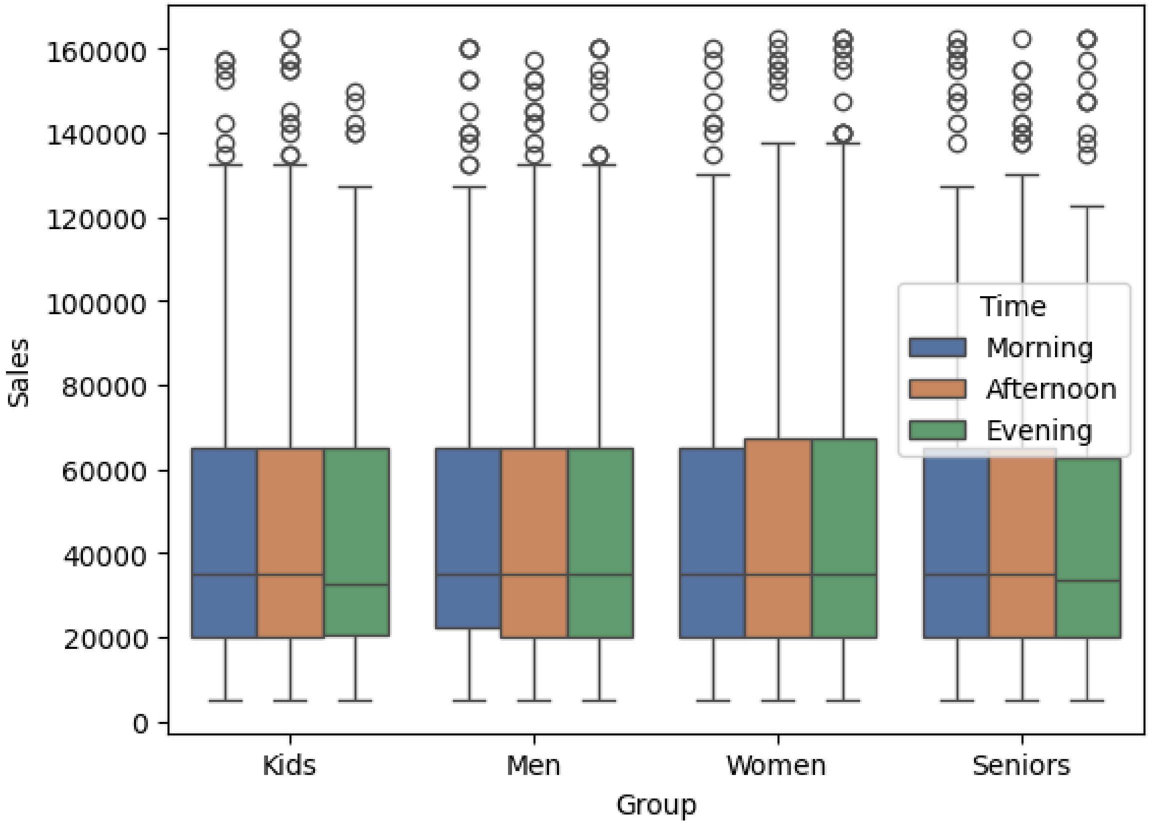
We can built complex Plots which is easy to use

```
In [ ]:
```

Question 4: Report generation

```
In [199…: sns.boxplot(y = 'Sales', x = 'Group', data = df, palette = 'deep', hue = 'Time',
```

```
Out[199…: <Axes: xlabel='Group', ylabel='Sales'>
```



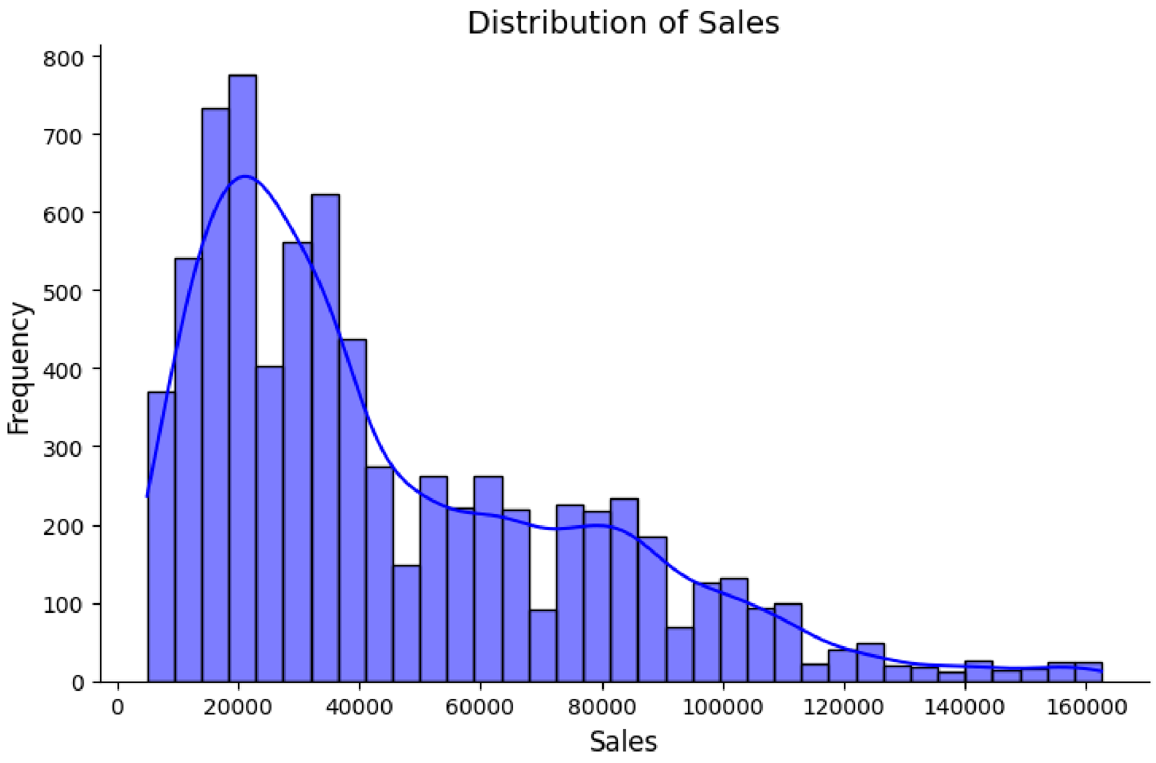
In [ ]:

Question 4.c.1: Use suitable graphs, plots, and analysis reports in the report, along with recommendations. Note that various aspects of analysis require different graphs and plots.

○ Use a box plot for descriptive statistics.

In [200…

```
# Distribution plot for Sales
sns.displot(df['Sales'], kde=True, color='blue', height=5, aspect=1.5)

# Add labels and title
plt.title("Distribution of Sales", fontsize=14)
plt.xlabel("Sales", fontsize=12)
plt.ylabel("Frequency", fontsize=12)

# Show the plot
plt.tight_layout()
plt.show()
```

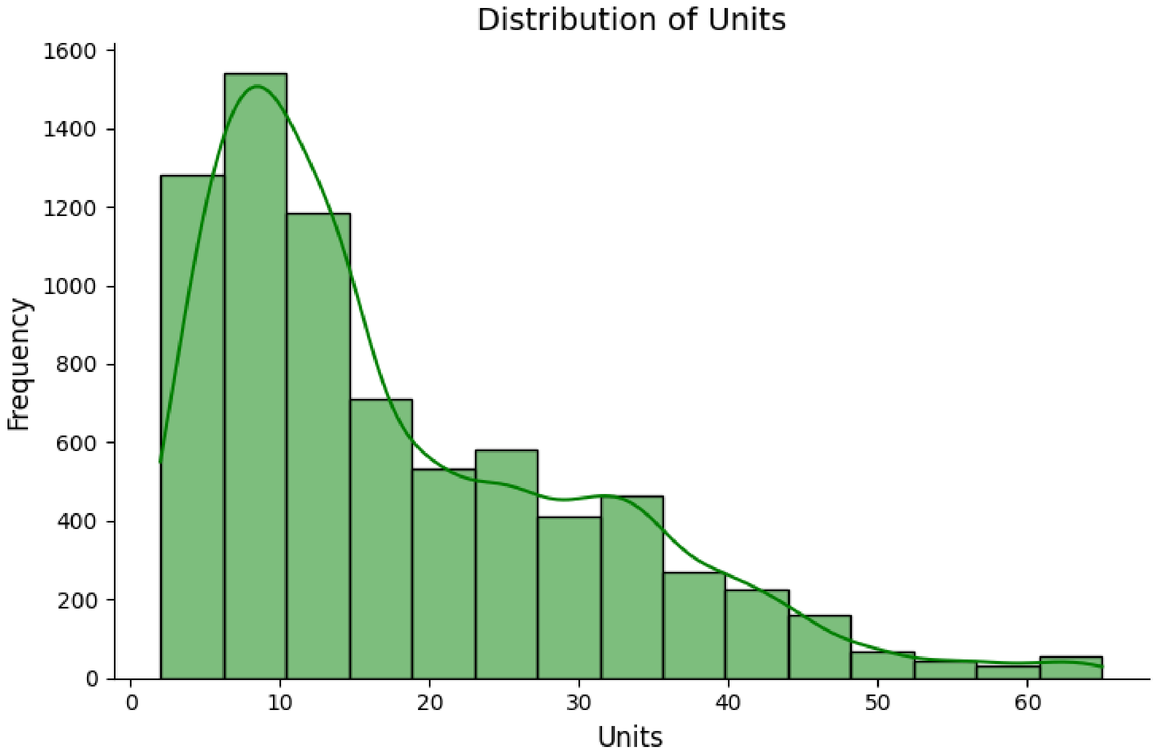


Question 4.c.2: Use suitable graphs, plots, and analysis reports in the report, along with recommendations. Note that various aspects of analysis require different graphs and plots.

○ Use the Seaborn distribution plot for any other statistical plotting.

In [201…

```
# Distribution plot for Unit
sns.displot(df['Unit'], kde=True, color='green', bins = 15, height=5, aspect=1.5

# Add labels and title
plt.title("Distribution of Units", fontsize=14)
plt.xlabel("Units", fontsize=12)
plt.ylabel("Frequency", fontsize=12)

# Show the plot
plt.tight_layout()
plt.show()
```


Distribution of Units
Frequency
0
200
400
600
800
1000
1200
1400
1600
0
10
20
30
40
50
60
Units

```
In [ ]:
```

```
In [ ]:
```