lab-4-data-visualization-eda-3

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1 Lab 4: Data Visualization and EDA

Objectives: - To gain practice in creating various data visualizations - To encourage students to perform EDA on the required dataset

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1. Load all Superstore datasets.

Note: The same dataset used in Lab 3

[1]:

```python
# Write your code here
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
df1 = pd.read_csv(r"superstore_order.csv")
df2 = pd.read_csv(r"superstore_people.csv")
df3 = pd.read_csv(r"superstore_return.csv")
```

2. Determine shape of each dataset (print out the results as well).

[2]:

```python
df1.shape
df2.shape
df3.shape
print(df1.shape, df2.shape, df3.shape)
```

```
(8880, 21) (4, 2) (296, 2)
```

3. Show information of the dataset.

[3]:

```python
# Write your code here (3.1)
print(df1.info, df2.info, df3.info)
```

```
<bound method DataFrame.info of       Row ID        Order ID  Order Date   Ship
Date       Ship Mode  \
0          1  CA-2016-152156  08/11/2016  11/11/2016    Second Class
1          2  CA-2016-152156  08/11/2016  11/11/2016    Second Class
2          3  CA-2016-138688  12/06/2016  16/06/2016    Second Class
3          4  US-2015-108966  11/10/2015  18/10/2015  Standard Class
```

```
4          5  US-2015-108966  11/10/2015  18/10/2015  Standard Class
…      …             …          …          …             …
8875    8876  US-2016-141264  13/08/2016  19/08/2016  Standard Class
8876    8877  US-2016-141264  13/08/2016  19/08/2016  Standard Class
8877    8878  CA-2017-126928  17/09/2017  23/09/2017  Standard Class
8878    8879  CA-2017-126928  17/09/2017  23/09/2017  Standard Class
8879    8880  US-2015-107944  23/03/2015  25/03/2015     First Class

     Customer ID    Customer Name    Segment        Country            City  \
0       CG-12520      Claire Gute   Consumer  United States       Henderson
1       CG-12520      Claire Gute   Consumer  United States       Henderson
2       DV-13045  Darrin Van Huff  Corporate  United States     Los Angeles
3       SO-20335    Sean ODonnell   Consumer  United States  Fort Lauderdale
4       SO-20335    Sean ODonnell   Consumer  United States  Fort Lauderdale
…            …                …          …              …               …
8875    CT-11995     Carol Triggs   Consumer  United States          Irving
8876    CT-11995     Carol Triggs   Consumer  United States          Irving
8877    GZ-14470     Gary Zandusky  Consumer  United States      Morristown
8878    GZ-14470     Gary Zandusky  Consumer  United States      Morristown
8879    AM-10360  Alice McCarthy  Corporate  United States     Los Angeles

      … Postal Code   Region       Product ID         Category Sub-Category  \
0     …       42420    South  FUR-BO-10001798        Furniture    Bookcases
1     …       42420    South  FUR-CH-10000454        Furniture       Chairs
2     …       90036     West  OFF-LA-10000240  Office Supplies       Labels
3     …       33311    South  FUR-TA-10000577        Furniture       Tables
4     …       33311    South  OFF-ST-10000760  Office Supplies      Storage
…   …           …      …                …                …            …
8875  …       75061  Central  OFF-SU-10003505  Office Supplies     Supplies
8876  …       75061  Central  OFF-AP-10002534  Office Supplies   Appliances
8877  …        7960     East  TEC-MA-10004626       Technology     Machines
8878  …        7960     East  OFF-ST-10000615  Office Supplies      Storage
8879  …       90008     West  OFF-PA-10000659  Office Supplies        Paper

                                           Product Name     Sales  Quantity  \
0                     Bush Somerset Collection Bookcase  261.9600         2
1     Hon Deluxe Fabric Upholstered Stacking Chairs …  731.9400         3
2     Self-Adhesive Address Labels for Typewriters b…   14.6200         2
3         Bretford CR4500 Series Slim Rectangular Table  957.5775         5
4                        Eldon Fold N Roll Cart System   22.3680         2
…                                                   …         …       …
8875                      Premier Electric Letter Opener  185.3760         2
8876  3.6 Cubic Foot Counter Height Office Refrigerator   58.9240         1
8877  Lexmark 20R1285 X6650 Wireless All-in-One Printer  480.0000         4
8878  SimpliFile Personal File Black Granite 15w x 6…   34.0500         3
8879  TOPS Carbonless Receipt Book Four 2-3/4 x 7-1/…  192.7200        11

      Discount    Profit
```

```
0         0.00   41.9136
1         0.00  219.5820
2         0.00    6.8714
3         0.45 -383.0310
4         0.20    2.5164
…        …       …
8875      0.20  -34.7580
8876      0.80 -153.2024
8877      0.00  225.6000
8878      0.00    9.5340
8879      0.00   92.5056

[8880 rows x 21 columns]> <bound method DataFrame.info of               Person
Region
0      Anna Andreadi     West
1        Chuck Magee     East
2     Kelly Williams  Central
3  Cassandra Brandow    South> <bound method DataFrame.info of     Returned
Order ID
0        Yes  CA-2017-153822
1        Yes  CA-2017-129707
2        Yes  CA-2014-152345
3        Yes  CA-2015-156440
4        Yes  US-2017-155999
..       …            …
291      Yes  CA-2015-101910
292      Yes  CA-2017-156958
293      Yes  CA-2016-105585
294      Yes  CA-2016-148796
295      Yes  CA-2015-149636

[296 rows x 2 columns]>
```

4. Are there any missing values? If so, in which column?

Ans: Nothing is missing.

5.

- 5.1 List unique segments
- 5.2 List unique segments and their corresponding count
- 5.3 Create a pie chart to demonstrate unique segments and their count
- 5.4 Briefly describe what could be interpreted from this pie chart

Note: please create additional cells to answer 5.2 - 5.3

[4]:
```
# Write your code here (5.1)
df1['Segment'].unique()
```

[4]:
```
array(['Consumer', 'Corporate', 'Home Office'], dtype=object)
```

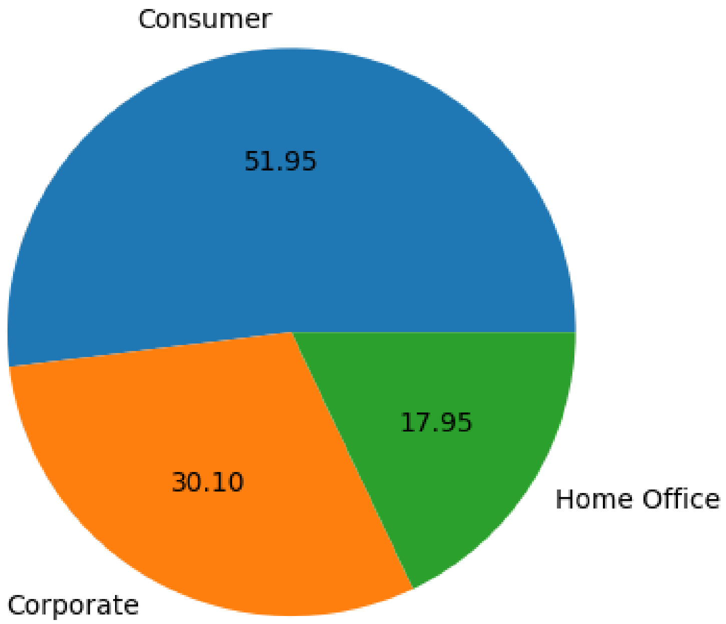
[5]:

```
chart = df1['Segment'].value_counts()
print(chart)
```

```
Consumer       4613
Corporate      2673
Home Office    1594
Name: Segment, dtype: int64
```

[6]:

```
y = np.array(chart)
myLabels = df1['Segment'].unique()
plt.pie(y, labels = myLabels, autopct='%.2f')
plt.show()
```



Answer for the question 5.4

Ans: You can estimates that order that is has significant to the superstore to manage the bussiness plan in the future.

6.

- 6.1 List unique states
- 6.2 List top-10 unique states and their corresponding count
- 6.3 Create a bar chart (vertical) to demonstrate the count of top-10 unique states
- 6.4 Based on 6.2, also include the total sales of these states (show your result as a dataframe)

- 6.5 Using the result from 6.4, if you were the owner of this superstore, what information could be interpreted from this result?

Note: please create additional cells to answer 6.2 - 6.4

[7]:

```
# Write your code here (6.1)
uniqueState = df1['State'].unique
```

[8]:

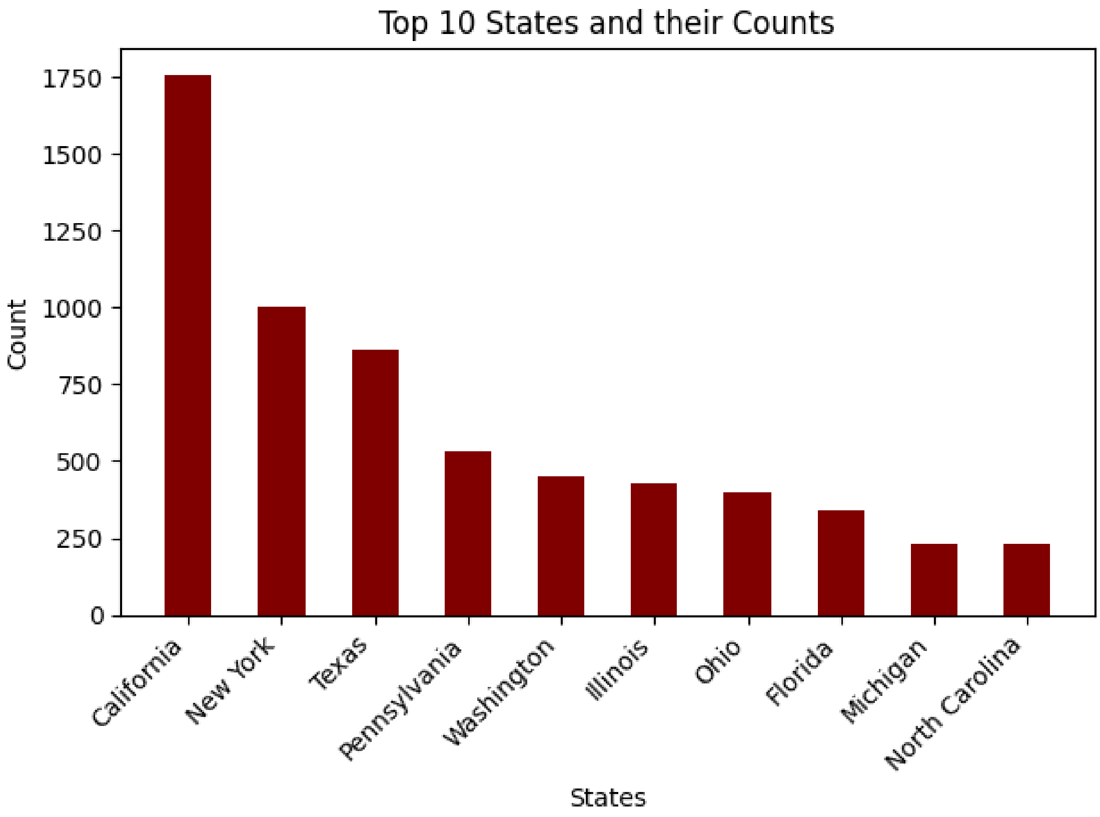
```
top_states = df1['State'].value_counts().head(10)
print(top_states)
```

```
California        1754
New York          1001
Texas              860
Pennsylvania       531
Washington         452
Illinois           427
Ohio               396
Florida            339
Michigan           230
North Carolina     229
Name: State, dtype: int64
```

[9]:

```
state_names = top_states.index
state_counts = top_states.values

plt.bar(state_names, state_counts, color='maroon', width=0.5)
plt.xlabel("States")
plt.ylabel("Count")
plt.title("Top 10 States and their Counts")
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```



[10]:

```
#6.4

total_sales = []
for i in top_states.index:
    sales_sum = df1[df1['State'] == i]['Sales'].sum()
    total_sales.append(sales_sum)

result_df = pd.DataFrame({
    'State': state_names,
    'Count': top_states.values,
    'Total Sales': total_sales
})

print(result_df)
```

```
          State  Count  Total Sales
0    California   1754  399195.4555
1      New York   1001  274866.8190
2         Texas    860  147855.0282
3  Pennsylvania    531  103852.5210
4    Washington    452  124497.7780
```

```
5        Illinois    427   71456.1780
6            Ohio    396   67924.2140
7         Florida    339   84083.0880
8        Michigan    230   62147.6960
9  North Carolina    229   49962.1580
```

Answer for the question 6.5

Ans: You can see that most top 10 state that was order that product from superstore.

7.

- 7.1 List unique categories
- 7.2 Create a bar chart (horizontal) to demonstrate the proportion of these categories
- 7.3 Compute the ratio of these categories in percentage and print the results

Note: please create additional cells to answer 7.2 - 7.3

[11]:

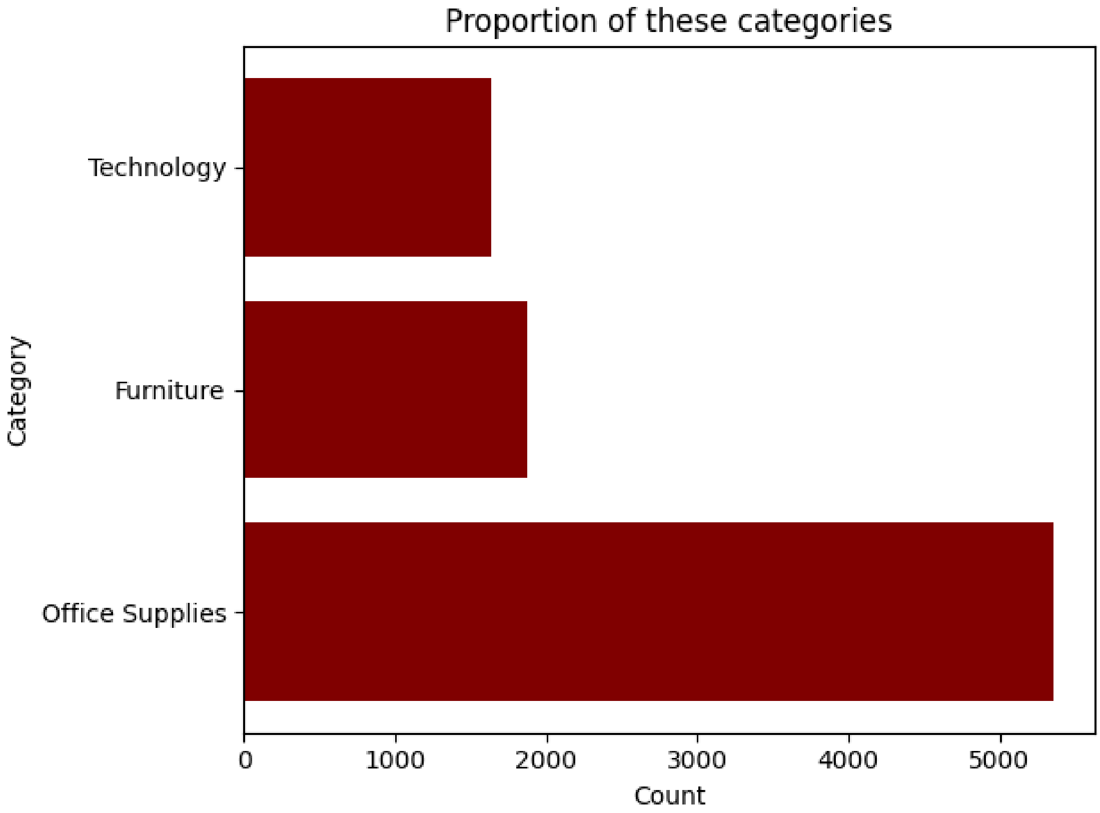
```
# Write your code here (7.1)
uniqueCategory =df1['Category'].unique()
print(uniqueCategory)
```

```
['Furniture' 'Office Supplies' 'Technology']
```

[12]:

```
valueCategory = df1['Category'].value_counts()

plt.barh(valueCategory.index, valueCategory.values, color='maroon')
plt.xlabel("Count")
plt.ylabel("Category")
plt.title("Proportion of these categories")
plt.tight_layout()
plt.show()
```



[13]:

```
valueCategory = df1['Category'].value_counts()
total_count = valueCategory.sum()

category_percentages = (valueCategory / total_count) * 100

print("Category Ratios (Percentage):")
print(category_percentages)
```

```
Category Ratios (Percentage):
Office Supplies    60.360360
Furniture          21.171171
Technology         18.468468
Name: Category, dtype: float64
```

8. Update the type of all columns that contain dates to *datetime* and show information after an update.

[14]:

```
df1['Order Date'] = pd.to_datetime(df1['Order Date'], format='%d/%m/%Y')
df1['Ship Date'] = pd.to_datetime(df1['Ship Date'], format='%d/%m/%Y')

(df1[['Order Date', 'Ship Date']])
```

[14]:

```
     Order Date  Ship Date
0    2016-11-08 2016-11-11
1    2016-11-08 2016-11-11
2    2016-06-12 2016-06-16
3    2015-10-11 2015-10-18
4    2015-10-11 2015-10-18
…           …          …
8875 2016-08-13 2016-08-19
8876 2016-08-13 2016-08-19
8877 2017-09-17 2017-09-23
8878 2017-09-17 2017-09-23
8879 2015-03-23 2015-03-25

[8880 rows x 2 columns]
```

9. Create a new column “Processing time day” to show number of days taken to ship an order and show your result in a dataframe format.

Hint: The duration starts as soon as the item has been ordered and ends once the order has successfully shipped.

[15]:

```python
# write your code here
df1['Processing time day'] = (df1['Ship Date'] - df1['Order Date']).dt.days
df1[['Order Date', 'Ship Date', 'Processing time day']]
```

[15]:

```
     Order Date  Ship Date  Processing time day
0    2016-11-08 2016-11-11                    3
1    2016-11-08 2016-11-11                    3
2    2016-06-12 2016-06-16                    4
3    2015-10-11 2015-10-18                    7
4    2015-10-11 2015-10-18                    7
…           …          …                  …
8875 2016-08-13 2016-08-19                    6
8876 2016-08-13 2016-08-19                    6
8877 2017-09-17 2017-09-23                    6
8878 2017-09-17 2017-09-23                    6
8879 2015-03-23 2015-03-25                    2

[8880 rows x 3 columns]
```

10. Based on the result in 9.

- 10.1 How many orders are there that take more than 5 days to process?
- 10.2 Show the top 5 rows (expected output should contain these columns: Order ID, Order Date, Ship Date, Processing time day, Quantity)
- 10.3 Plot the histogram based on the column Quantity

Note: please create additional cells to answer 10.2 - 10.3

[16]:

```
print(f"Number of orders that take more than 5 days: {df1[df1['Processing time␣
  ↪day'] > 5]['Order Date'].count()}")
```

```
Number of orders that take more than 5 days: 1656
```

[17]:

```
df1[['Order ID', 'Order Date', 'Ship Date', 'Processing time day', 'Quantity']].
  ↪head()
```

[17]:

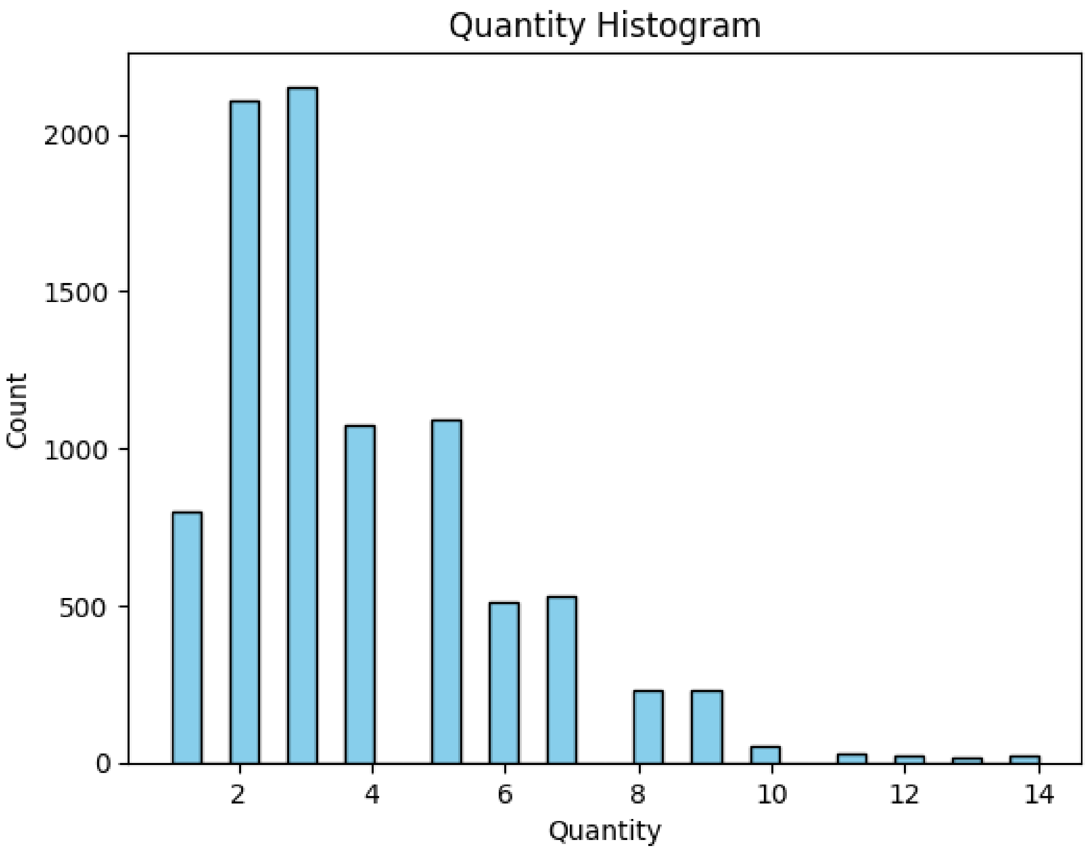
```
         Order ID Order Date  Ship Date  Processing time day  Quantity
0  CA-2016-152156 2016-11-08 2016-11-11                    3         2
1  CA-2016-152156 2016-11-08 2016-11-11                    3         3
2  CA-2016-138688 2016-06-12 2016-06-16                    4         2
3  US-2015-108966 2015-10-11 2015-10-18                    7         5
4  US-2015-108966 2015-10-11 2015-10-18                    7         2
```

[18]:

```
plt.hist(df1['Quantity'], bins=30, color='skyblue', edgecolor='black')

plt.xlabel('Quantity')
plt.ylabel('Count')
plt.title('Quantity Histogram')

plt.show()
```



[BONUS 20 pts] Determine the percentage of customers who: - B1)returned the product once - B2) returned the product at least once - B3) never returned the product - Finally, Plot a comparison of B2 and B3

Note: please create additional cells to answer the above points

[181]:

```
df1.drop_duplicates(subset='Order ID', keep='first', inplace=True)
mergeDf = pd.merge(df1, df3, on='Order ID', how='left')
mergeDf['Returned'].fillna(0, inplace=True)

# Replace 'yes' with 1 and 'no' with 0 in the 'Returned' column
mergeDf['Returned'] = mergeDf['Returned'].replace({'yes': 1, 'Yes' :1})
mergeDf['Returned'] = pd.to_numeric(mergeDf['Returned'])

returnCounts = mergeDf.groupby('Customer ID')['Returned'].sum()
totalCustomer = len(returnCounts)
returnOnce = (returnCounts == 1).sum()
print(str(returnOnce) + ' People')
print((returnOnce/totalCustomer)*100)
```

```
186 People
23.574144486692013
```

[183]:

```
returnAtLeastOne = (returnCounts >= 1).sum()
print(str(returnAtLeastOne) + ' People')
print((returnAtLeastOne/totalCustomer)*100)
```

```
222 People
28.13688212927757
```

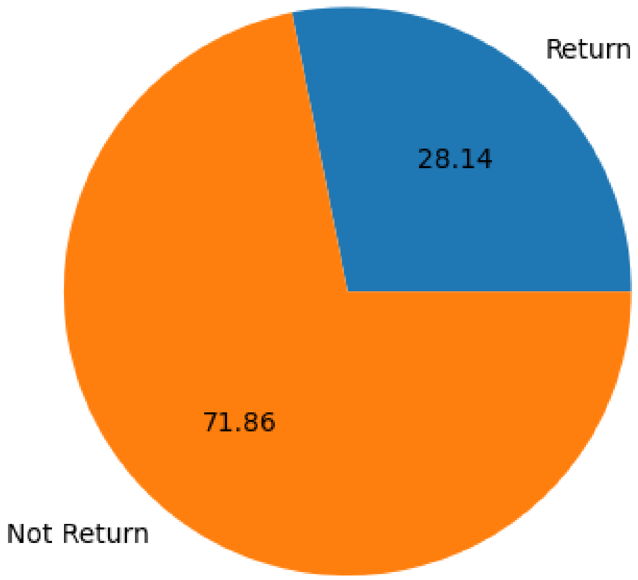
[184]:

```
noReturn = (returnCounts == 0).sum()
print(str(noReturn) + ' People')
print((noReturn/totalCustomer)*100)
```

```
567 People
71.86311787072243
```

[187]:

```
y = np.array([returnAtLeastOne, noReturn])
myLabels = ['Return', 'Not Return']
plt.pie(y, labels = myLabels, autopct='%.2f')
plt.show()
```


Return
28.14
71.86
Not Return