Response_Challenge

January 19, 2022

1 Shopify Data Science Intern Challenge

1.1 Question 1

[1]:
```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

```
/Users/_nltdzdbh_/.pyenv/versions/3.8.5/lib/python3.8/site-
packages/pandas/compat/__init__.py:124: UserWarning: Could not import the lzma
module. Your installed Python is incomplete. Attempting to use lzma compression
will result in a RuntimeError.
  warnings.warn(msg)
```

[2]:
```
data = pd.read_csv("Q1_data.csv")
```

[3]:
```
# preview dataset
```

[4]:
```
data.head()
```

[4]:

	order_id	shop_id	user_id	order_amount	total_items	payment_method	created_at
0	1	53	746	224	2	cash	2017-03-13 12:36:56
1	2	92	925	90	1	cash	2017-03-03 17:38:52
2	3	44	861	144	1	cash	2017-03-14 4:23:56
3	4	18	935	156	1	credit_card	2017-03-26 12:43:37
4	5	18	883	156	1	credit_card	2017-03-01 4:35:11

[5]:
```
#Retrieve information from dataset
```

Preprocessing Dataset

[6]:
```
data.dtypes
```

[6]:
```
order_id           int64
shop_id            int64
user_id            int64
order_amount       int64
total_items        int64
payment_method    object
created_at        object
dtype: object
```

Data type of this dataset is good. Int64 for quantitative attribut and object type for qualitatives attributs

[7]:
```
#Verify if there is a missing value in dataset
```

[8]:
```
def countMissingValue(data):  # test if there is number of missing value
    bool = True
    table = data.isnull().sum(axis=1)
    for i in range(len(table)):
        if(table.iloc[i, ] == 0):
            bool = False
            continue
        else:
            bool = True

    return bool
```

[9]:
```
countMissingValue(data)
```

[9]:
```
False
```

So we can see that our dataset is cleaned, the analysis will not be influenced by missing value or wrong DataType!

1.1.1 a) Think about what could be going wrong with our calculation. Think about a better way to evaluate this data.

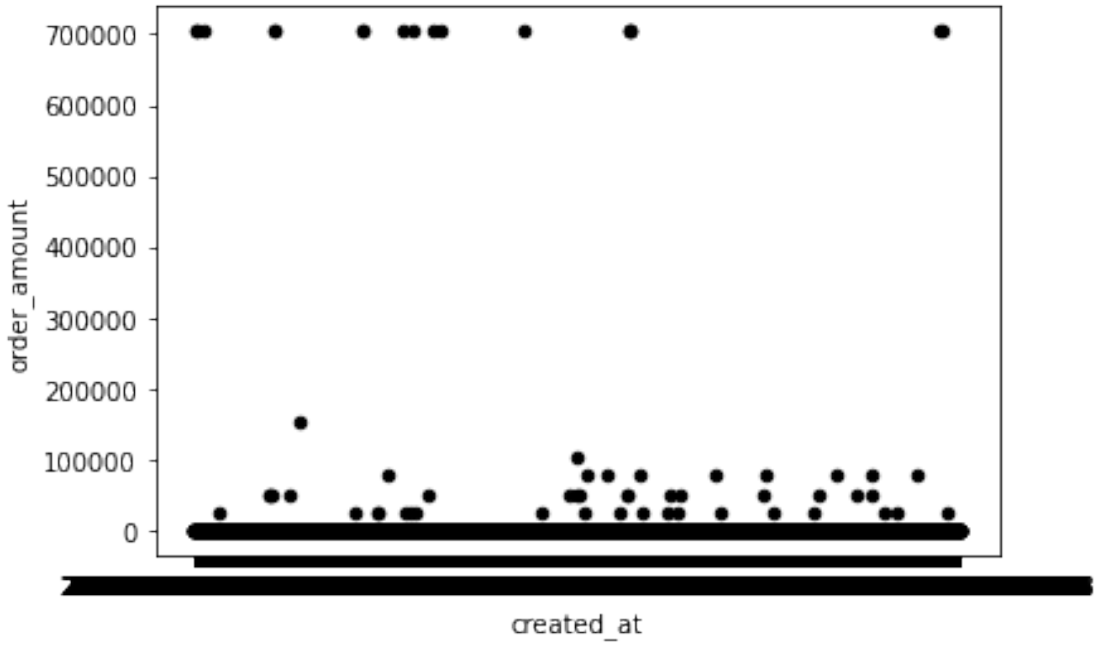
[10]:
```
data.describe()
```

[10]:

	order_id	shop_id	user_id	order_amount	total_items
count	5000.000000	5000.000000	5000.000000	5000.000000	5000.00000
mean	2500.500000	50.078800	849.092400	3145.128000	8.78720
std	1443.520003	29.006118	87.798982	41282.539349	116.32032
min	1.000000	1.000000	607.000000	90.000000	1.00000
25%	1250.750000	24.000000	775.000000	163.000000	1.00000

```
50%     2500.500000     50.000000    849.000000      284.000000       2.00000
75%     3750.250000     75.000000    925.000000      390.000000       3.00000
max     5000.000000    100.000000    999.000000   704000.000000    2000.00000
```

[11]:
```
fig = data.plot.scatter(x='created_at',y='order_amount', c='black')
```



As we can see, the mean of the order_amount is 3145.128$, but the median is only 284. So we can remark that the distribution of order_amount is positive skew, even 75%(3rd quantile) is only 390 ! So the mean is influenced by thoses outliers (order_amount >= 700000). So mean in this situation is not really reprensentative the situation of the commercial. If we say only mean = 3145.128, we can tell that AOV is actually high for sneaker's industry. But here each store sell only one model of sneaker, so it can be overevaluate and overestimate, and it didn't help the owner to make a good decision.

In my opinion, we can sort and merge data for each store (group by shop_id)

[12]:
```
#Retrieve data for analyse more efficiently
```

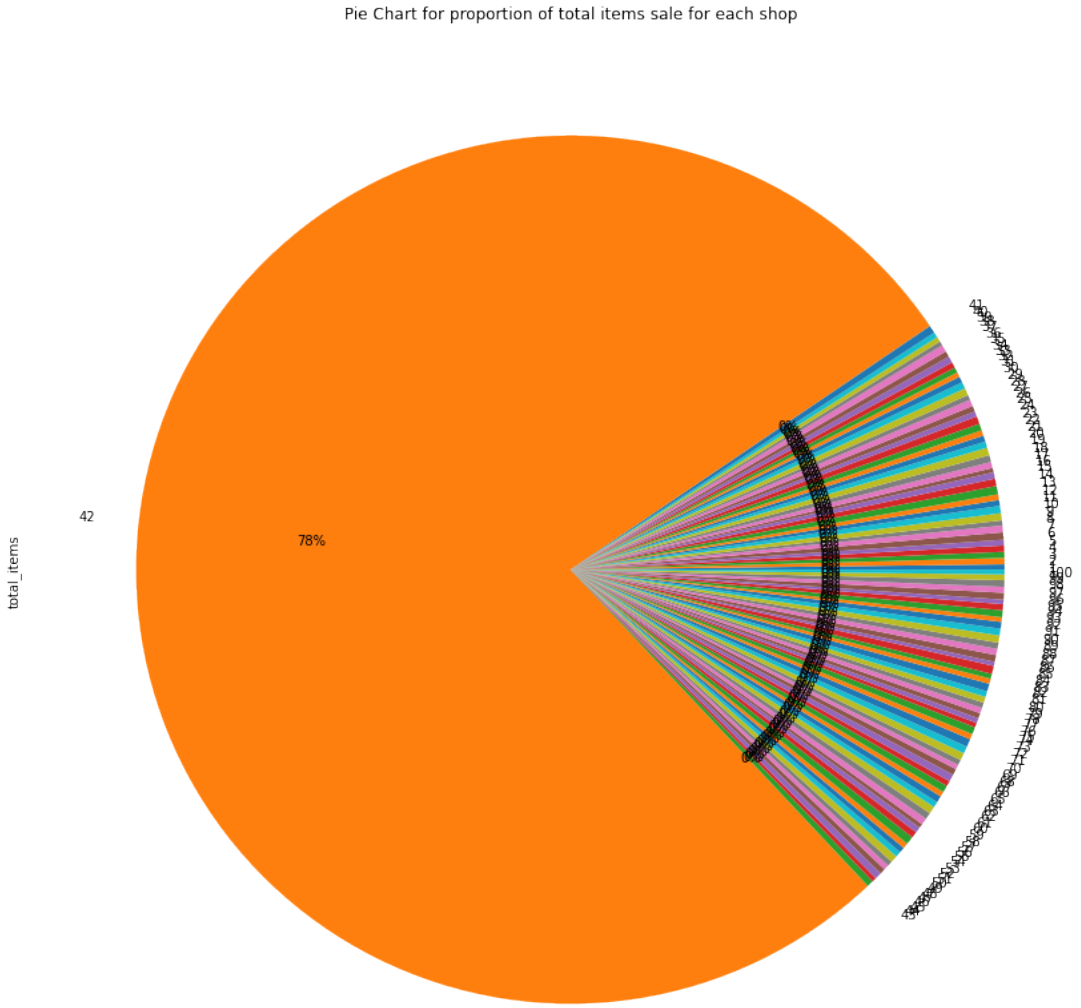
[13]:
```
def extractInfo(data,shopID,typedata) :
    totalItem = data[[shopID]].iloc[0]
    total = data.sum()

    print("Total "+ typedata + " sold by shop",shopID,':',totalItem)
    print("which taking a percentage of ",totalItem/total )
```

[14]:
```
#group by shop_id : total item sold by each shop
```

[15]:
```
dataByTotalItem = data.groupby(['shop_id'])['total_items'].sum()
```

[16]:
```
fig2 = dataByTotalItem.plot.pie(figsize=(15,15),autopct='%1.0f%%',
                                title = 'Pie Chart for proportion of total␣
↪items sale for each shop')
```



[17]:
```
extractInfo(dataByTotalItem,42,"item")
```

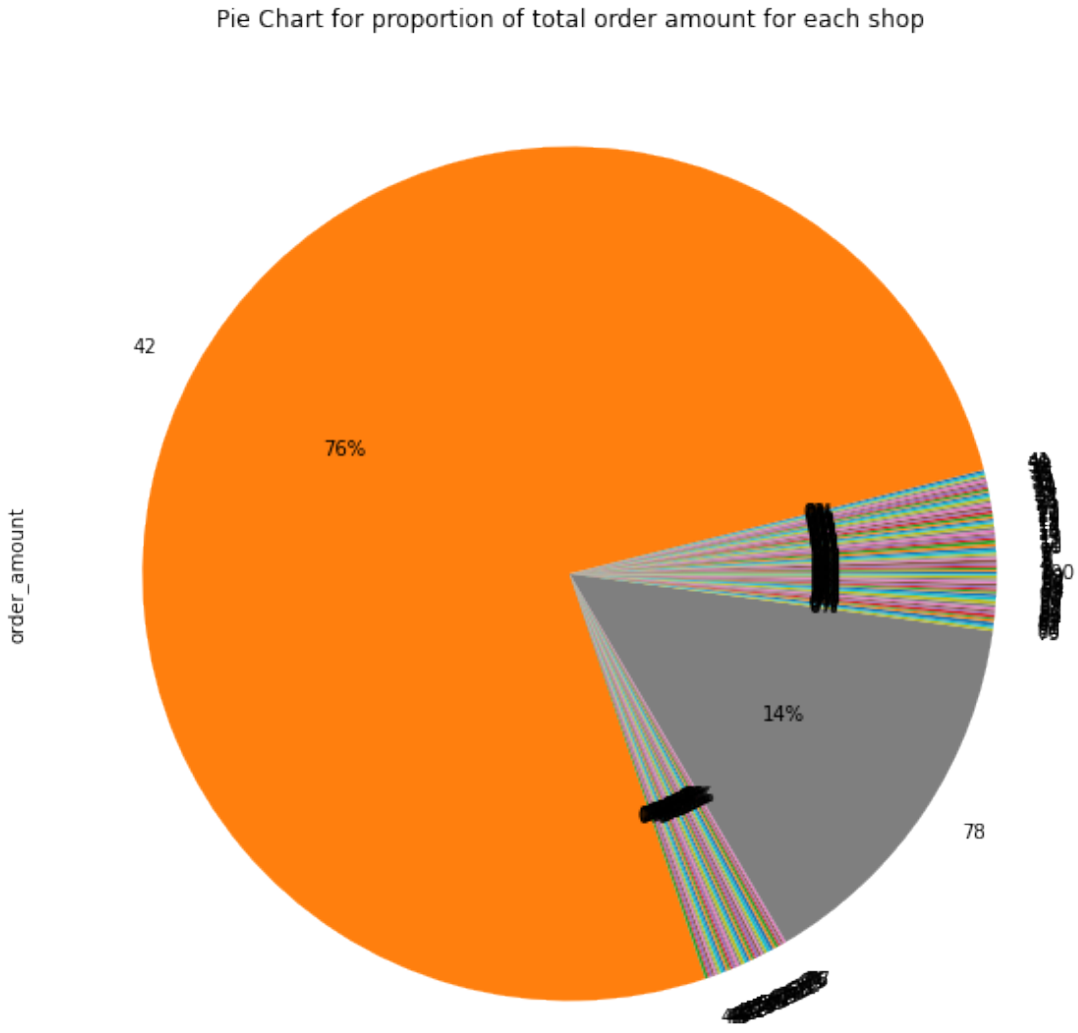
```
Total item sold by shop 42 : 34063
which taking a percentage of  0.7752867807720321
```

[18]:
```
extractInfo(dataByTotalItem,78,'item')
```

```
Total item sold by shop 78 : 88
which taking a percentage of  0.002002913328477786
```

[19]:
```
dataByOrderAmount = data.groupby(['shop_id'])['order_amount'].sum()
```

[20]:
```
fig3 = dataByOrderAmount.plot.pie(figsize=(10,10),autopct='%1.0f%%',
                                  title = 'Pie Chart for proportion of total order amount for each shop')
```



[21]:
```
extractInfo(dataByOrderAmount,42,'order_amount')
```

```
Total order_amount sold by shop 42 : 11990176
which taking a percentage of  0.7624602877847897
```

[22]:
```
extractInfo(dataByOrderAmount,78,'order_amount')
```

```
Total order_amount sold by shop 78 : 2263800
which taking a percentage of  0.1439559852571978
```

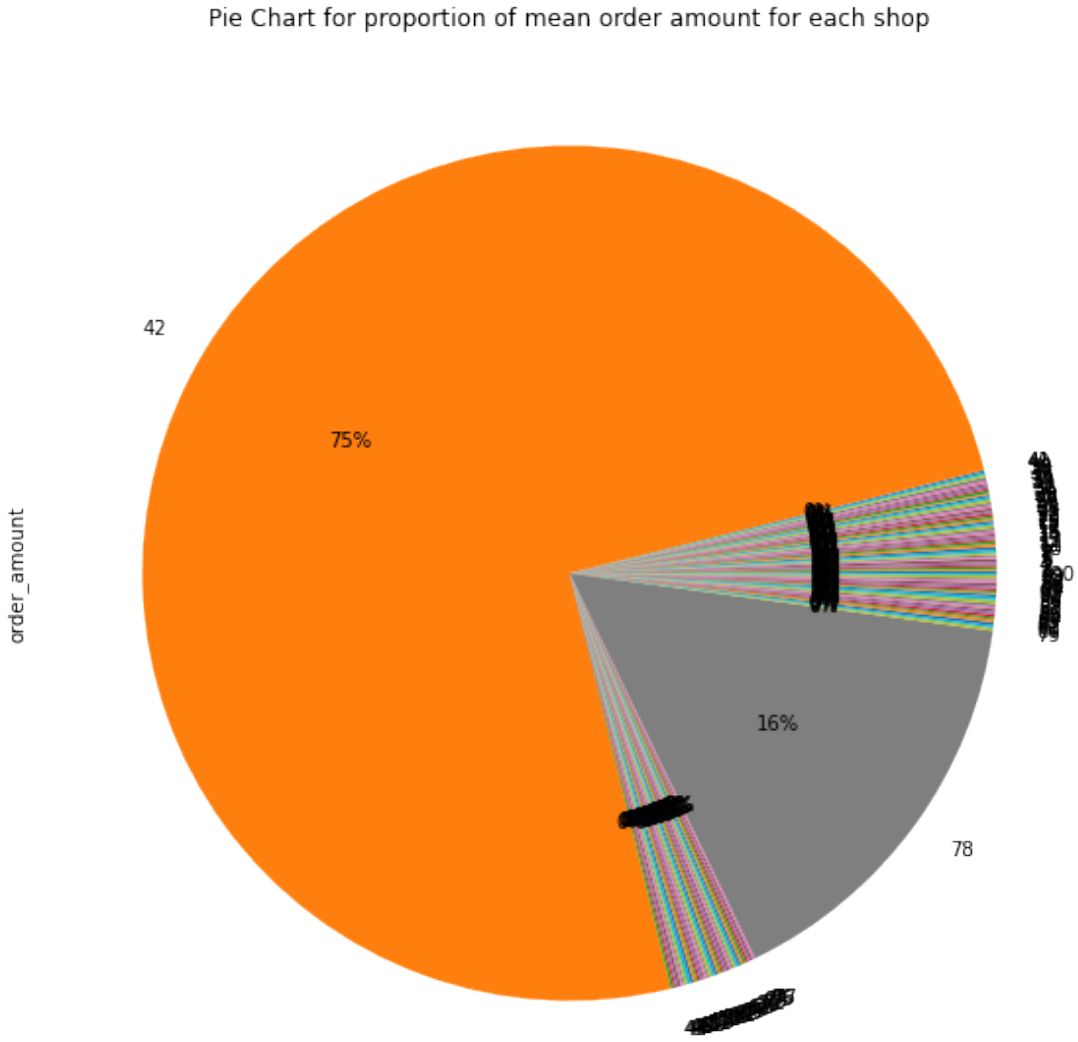
From 2 thoses pie chart, we can remark that store #42 sell most of items from all store, and al

[23]:
```
dataMeanOrderAmount = data.groupby(['shop_id'])['order_amount'].mean()
```

[24]:
```
dataMeanOrderAmount
```

[24]:
```
shop_id
1      308.818182
2      174.327273
3      305.250000
4      258.509804
5      290.311111
          …
96     330.000000
97     324.000000
98     245.362069
99     339.444444
100    213.675000
Name: order_amount, Length: 100, dtype: float64
```

[25]:
```
fig4 = dataMeanOrderAmount.plot.pie(figsize=(10,10),autopct='%1.0f%%',
                                    title = 'Pie Chart for proportion of mean order␣
↪amount for each shop')
```



[35]:
```
extractInfo(dataMeanOrderAmount,42,'mean')
```

```
Total mean sold by shop 42 : 235101.49019607843
which taking a percentage of  0.7494865319907407
```

[36]:
```
extractInfo(dataMeanOrderAmount,78,'mean')
```

```
Total mean sold by shop 78 : 49213.04347826087
which taking a percentage of  0.15688762012724378
```

Also we can evaluate the mean for each shop, most of them is around 200-300$ for mean, only shop 42 and 78 are taking a big part of the pie. And the owner now can analyse why there is a big different between theres 2 shop and 98 other shops (location, product, marketing, etc.)

1.1.2 b) What metric would you report for this dataset?

For the skewer distribution, i would like to use 5 number who represent in a better way the dataset with order_amount instead of mean : Min - Q1 - Median - Q3 - Max and IQR With theres 5 numbers, we can have an idea how the order_amount is distribued !

1.1.3 c) What is its value?

[26]:
```
data['order_amount'].describe()
```

[26]:
```
count      5000.000000
mean       3145.128000
std       41282.539349
min          90.000000
25%         163.000000
50%         284.000000
75%         390.000000
max      704000.000000
Name: order_amount, dtype: float64
```

- min = 90
- Q1 = 163
- median = 284
- Q3 = 390
- max = 704000
- IQR = Q3 - Q1 = 390 - 163 = 227

1.2 Question 2

[27]:
```
from IPython.display import Image
```

1.2.1 a) How many orders were shipped by Speedy Express in total?

[28]:
```
Image(filename='Image/Q2-a.png')
```

[28]:

SQL Statement:

```
SELECT Shippers.ShipperID, Shippers.ShipperName, COUNT(Orders.OrderID)
FROM Shippers, Orders
WHERE Shippers.ShipperID = Orders.ShipperID
GROUP BY Orders.ShipperID
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 3

ShipperID	ShipperName	COUNT(Orders.OrderID)
1	Speedy Express	54
2	United Package	74
3	Federal Shipping	68

So 54 orders were shipped by Speedy Express

1.2.2 b) What is the last name of the employee with the most orders?

[29]:
```
Image(filename='Image/Q2-b.png')
```

[29]:

SQL Statement:

```
SELECT Employees.LastName, COUNT(Orders.OrderID) as Total
FROM Employees, Orders
WHERE Employees.EmployeeID = Orders.EmployeeID
GROUP BY Orders.EmployeeID
ORDER BY Total DESC
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 9

LastName	Total
Peacock	40
Leverling	31
Davolio	29
Callahan	27
Fuller	20
Suyama	18
King	14
Buchanan	11
Dodsworth	6

The last name of the employee withe the most orders is Peacock.

1.2.3 c) What product was ordered the most by customers in Germany?

Scenario 1 : If we count by total quantity ordered, here is SQL code : SELECT Products.ProductID , ProductName as Product, SUM(OrderDetails.Quantity) as Quantity, Country FROM Orders INNER JOIN OrderDetails ON Orders.OrderID = OrderDetails.OrderID INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID INNER JOIN Products ON OrderDetails.ProductID = Products.ProductID WHERE Customers.Country = 'Germany' GROUP BY OrderDetails.productID ORDER BY Quantity DESC

[30]:
```
Image(filename='Image/Q2-c1.png')
```

[30]:

SQL Statement:

```
SELECT Products.ProductID , ProductName as Product, SUM(OrderDetails.Quantity) as Quantity, Country
        FROM Orders
        INNER JOIN OrderDetails ON Orders.OrderID = OrderDetails.OrderID
        INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID
        INNER JOIN Products ON OrderDetails.ProductID = Products.ProductID
        WHERE Customers.Country = 'Germany'
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 45

ProductID	Product	Quantity	Country
40	Boston Crab Meat	160	Germany
31	Gorgonzola Telino	125	Germany
23	Tunnbröd	105	Germany
35	Steeleye Stout	100	Germany
19	Teatime Chocolate Biscuits	95	Germany
72	Mozzarella di Giovanni	86	Germany
2	Chang	84	Germany

So the product most ordered by customers in Germany is Boston Crab Meat (with total quantity of 160)

Scenario 2 : If we count by quantity per order, here is SQL code : SELECT OrderDetails.OrderID, Products.ProductName, OrderDetails.Quantity as Quantity , Customers.Country FROM Orders, Customers, OrderDetails, Products WHERE Orders.CustomerID = Customers.CustomerID AND Orders.OrderID = OrderDetails.OrderID AND OrderDetails.ProductID = Products.ProductID AND Customers.Country = 'Germany' ORDER BY Quantity DESC

[31]:
```
Image(filename='Image/Q2-c2.png')
```

[31]:

SQL Statement:

```
SELECT OrderDetails.OrderID, Products.ProductName, OrderDetails.Quantity as Quantity , Customers.Country
FROM Orders, Customers, OrderDetails, Products
WHERE Orders.CustomerID = Customers.CustomerID AND
      Orders.OrderID = OrderDetails.OrderID AND
      OrderDetails.ProductID = Products.ProductID AND
      Customers.Country = 'Germany'
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 74

OrderID	ProductName	Quantity	Country
10286	Steeleye Stout	100	Germany
10345	Teatime Chocolate Biscuits	80	Germany
10267	Raclette Courdavault	70	Germany
10345	Northwoods Cranberry Sauce	70	Germany
10273	Boston Crab Meat	60	Germany
10396	Fløtemysost	60	Germany

So Steeleye Stout was ordered the most in order#10286 with quantity of 100 !

Scenario 3 : If we count by frequence of the product, here is SQL code : SELECT Products.ProductID , ProductName as Product, COUNT(OrderDetails.ProductID) as Frequence, Country FROM Orders INNER JOIN OrderDetails ON Orders.OrderID = OrderDetails.OrderID INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID INNER JOIN Products ON OrderDetails.ProductID = Products.ProductID WHERE Customers.Country = 'Germany' GROUP BY OrderDetails.productID ORDER BY Frequence DESC

[32]:
```
Image(filename='Image/Q2-c3.png')
```

[32]:

SQL Statement:

```
SELECT Products.ProductID , ProductName as Product, COUNT(OrderDetails.ProductID) as Frequence, Country
        FROM Orders
        INNER JOIN OrderDetails ON Orders.OrderID = OrderDetails.OrderID
        INNER JOIN Customers ON Orders.CustomerID = Customers.CustomerID
        INNER JOIN Products ON OrderDetails.ProductID = Products.ProductID
        WHERE Customers.Country = 'Germany'
```

Edit the SQL Statement, and click "Run SQL" to see the result.

Run SQL »

Result:

Number of Records: 45

ProductID	Product	Frequence	Country
31	Gorgonzola Telino	5	Germany
76	Lakkalikööri	4	Germany
40	Boston Crab Meat	4	Germany
72	Mozzarella di Giovanni	3	Germany
36	Inlagd Sill	3	Germany
23	Tunnbröd	3	Germany

So the product Gorgonzola Telino has the most frequence (5 times) in orders of the customers in Germany.

[ ]: