import numpy as np
import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

data= pd.read_csv('Amazon Sales data.csv')
data= pd.DataFrame(data= data)

data



}		Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Order ID	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	
	0	Australia and Oceania	Tuvalu	Baby Food	Offline	Н	5/28/2010	669165933	6/27/2010	9925	255.28	159.42	2533654.00	1582243.50	95′
	1	Central America and the Caribbean	Grenada	Cereal	Online	С	8/22/2012	963881480	9/15/2012	2804	205.70	117.11	576782.80	328376.44	248
	2	Europe	Russia	Office Supplies	Offline	L	05-02- 2014	341417157	05-08- 2014	1779	651.21	524.96	1158502.59	933903.84	22
	3	Sub- Saharan Africa	Sao Tome and Principe	Fruits	Online	С	6/20/2014	514321792	07-05- 2014	8102	9.33	6.92	75591.66	56065.84	1
	4	Sub- Saharan Africa	Rwanda	Office Supplies	Offline	L	02-01- 2013	115456712	02-06- 2013	5062	651.21	524.96	3296425.02	2657347.52	63
	95	Sub- Saharan Africa	Mali	Clothes	Online	M	7/26/2011	512878119	09-03- 2011	888	109.28	35.84	97040.64	31825.92	6
	96	Asia	Malaysia	Fruits	Offline	L	11-11- 2011	810711038	12/28/2011	6267	9.33	6.92	58471.11	43367.64	1
	97	Sub- Saharan Africa	Sierra Leone	Vegetables	Offline	С	06-01- 2016	728815257	6/29/2016	1485	154.06	90.93	228779.10	135031.05	93
	98	North America	Mexico	Personal Care	Offline	М	7/30/2015	559427106	08-08- 2015	5767	81.73	56.67	471336.91	326815.89	144
	99	Sub- Saharan Africa	Mozambique	Household	Offline	L	02-10- 2012	665095412	2/15/2012	5367	668.27	502.54	3586605.09	2697132.18	889
			_												

Next steps: Generate code with data

View recommended plots

New interactive sheet

data.head()

\rightarrow	⏷
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→		Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Order ID	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit
	0	Australia and Oceania	Tuvalu	Baby Food	Offline	Н	5/28/2010	669165933	6/27/2010	9925	255.28	159.42	2533654.00	1582243.50	951410.50
	1 (Central America and the Caribbean	Grenada	Cereal	Online	С	8/22/2012	963881480	9/15/2012	2804	205.70	117.11	576782.80	328376.44	248406.36
	2	Europe	Russia	Office Supplies	Offline	L	05-02- 2014	341417157	05-08- 2014	1779	651.21	524.96	1158502.59	933903.84	224598.75
	3	Sub- Saharan Africa	Sao Tome and Principe	Fruits	Online	С	6/20/2014	514321792	07-05- 2014	8102	9.33	6.92	75591.66	56065.84	19525.82

Next steps:

Generate code with data

View recommended plots

New interactive sheet

 \blacksquare

2.907680e+05

6.358288e+05

7.523144e+05 3.635664e+05

2.212045e+06 1.613870e+06

5.997055e+06 4.509794e+06 1.719922e+06

```
data.columns
```

data.shape

→ (100, 14)

data.size

→ 1400

data.info()

<class 'pandas.core.frame.DataFrame'> RangeIndex: 100 entries, 0 to 99 Data columns (total 14 columns): # Column Non-Null Count Dtype -----Region 100 non-null object Country 100 non-null object 1 2 Item Type 100 non-null object Sales Channel 100 non-null object 4 Order Priority 100 non-null object Order Date 100 non-null object Order ID 100 non-null int64 100 non-null Ship Date object 100 non-null 8 Units Sold int64 Unit Price 100 non-null float64 100 non-null float64 10 Unit Cost

dtypes: float64(5), int64(2), object(7)

5.577086e+08 5382.500000

7.907551e+08 7369.000000

9.940222e+08 9925.000000

100 non-null

100 non-null

100 non-null

data.describe()

11 Total Revenue

12 Total Cost

13 Total Profit

memory usage: 11.1+ KB

 $\overline{2}$ Order ID Units Sold Unit Price Unit Cost Total Revenue Total Cost Total Profit count 1.000000e+02 100.000000 100.000000 100.000000 1.000000e+02 1.000000e+02 1.000000e+02 5.550204e+08 5128.710000 276.761300 191.048000 1.373488e+06 9.318057e+05 4.416820e+05 mean std 2.606153e+08 2794.484562 235.592241 188.208181 1.460029e+06 1.083938e+06 4.385379e+05 min 1.146066e+08 124.000000 9.330000 6.920000 4.870260e+03 3.612240e+03 1.258020e+03 25% 3.389225e+08 2836.250000 81.730000 35.840000 2.687212e+05 1.688680e+05 1.214436e+05

668.270000 524.960000

107.275000

263.330000

179.880000

437.200000

float64

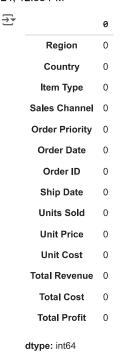
float64

float64

data.isna().sum()

50%

75%



data.dtypes

```
\overline{\Rightarrow}
                              0
          Region
                         object
          Country
                         object
         Item Type
                         object
      Sales Channel
                         object
       Order Priority
                         object
        Order Date
                         object
         Order ID
                          int64
         Ship Date
                         object
        Units Sold
                          int64
         Unit Price
                        float64
         Unit Cost
                        float64
      Total Revenue
                        float64
        Total Cost
                        float64
        Total Profit
                        float64
     dtype: object
```

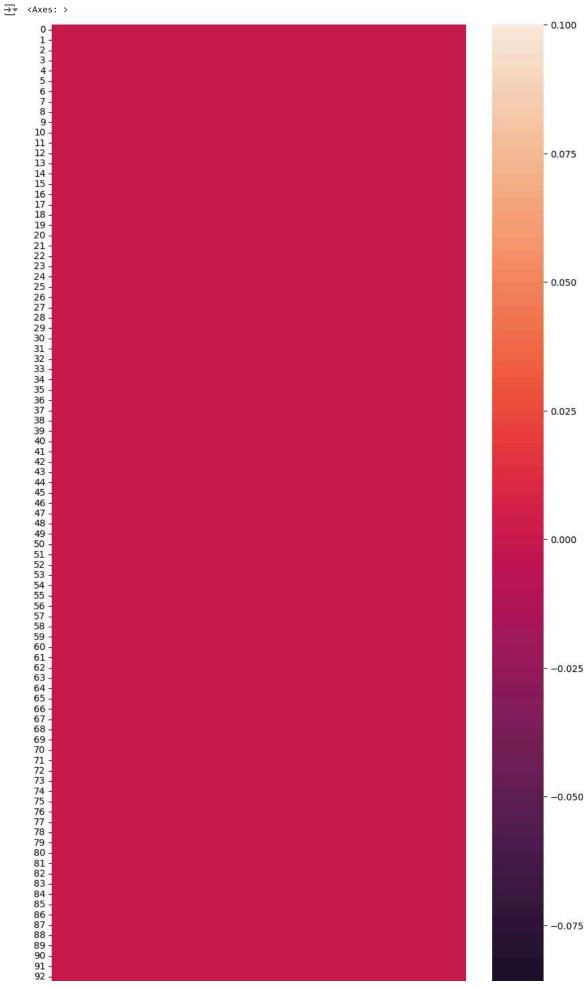
data = data.astype({'Ship Date': 'datetime64[ns]','Order Date':'datetime64[ns]'})

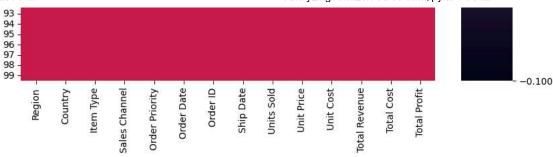
data.dtypes



Region object Country object Item Type object Sales Channel object **Order Priority** object Order Date datetime64[ns] Order ID int64 Ship Date datetime64[ns] **Units Sold** int64 **Unit Price** float64 **Unit Cost** float64 **Total Revenue** float64 **Total Cost** float64 Total Profit float64

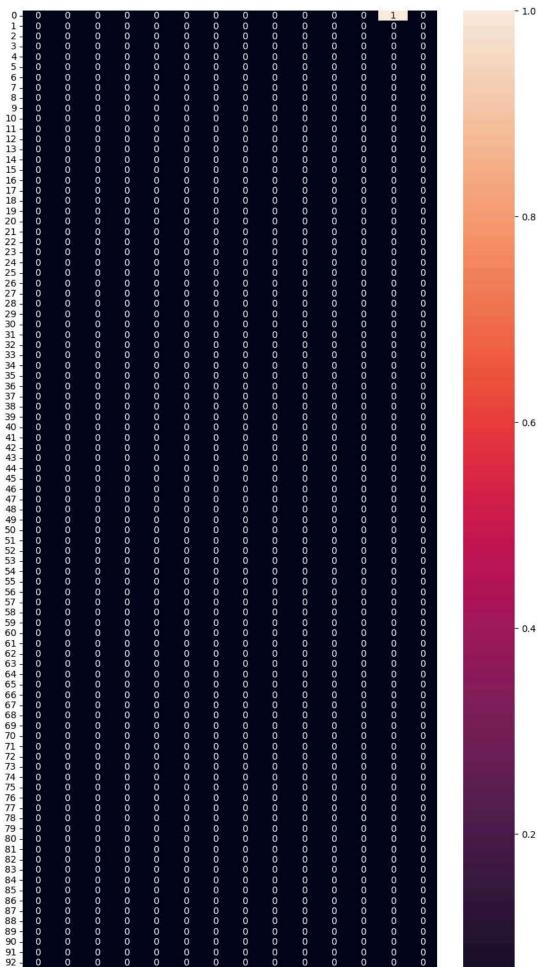
dtype: object

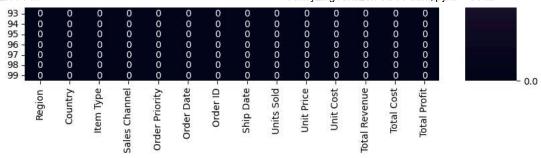




→ nan

plt.figure(figsize=(10,20))
sns.heatmap(data.isnull(),annot= True) #NULL VALUE FOUND IN 'TOTAL COST' COLUMN





data = data.fillna(data.mean()) #FILL MEAN WHERE NULL VALUE PRESENT

₹

```
TypeError Traceback (most recent call last)
<ipython-input-17-6303f0ce277a> in <cell line: 1>()
----> 1 data = data.fillna(data.mean()) #FILL MEAN WHERE NULL VALUE PRESENT
```

```
/usr/local/lib/python3.10/dist-packages/pandas/core/nanops.py in _ensure_numeric(x)

1684 if inferred in ["string", "mixed"]:

1685 # GH#44008, GH#36703 avoid casting e.g. strings to numeric

-> 1686 raise TypeError(f"Could not convert {x} to numeric")

1687 try:

1688 x = x.astype(np.complex128)
```

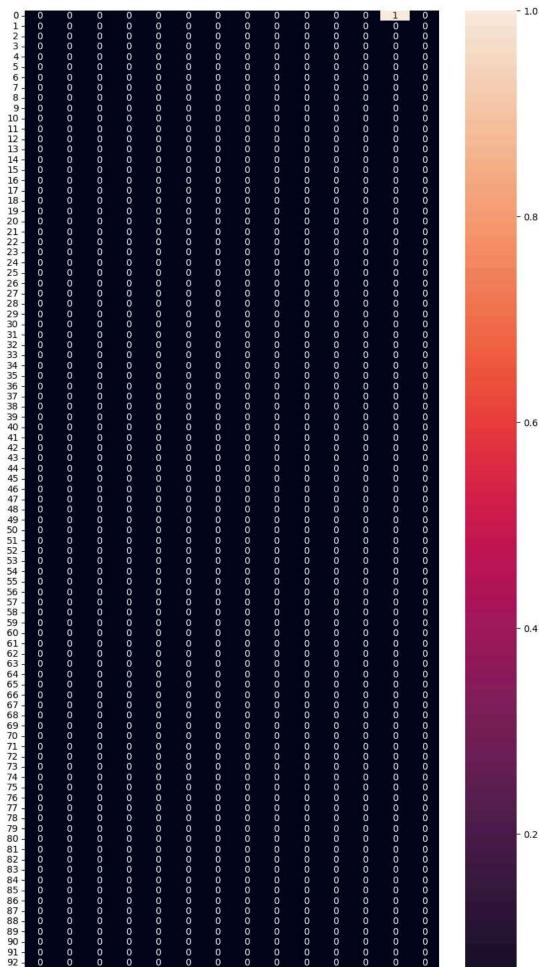
TypeError: Could not convert ['Australia and OceaniaCentral America and the CaribbeanEuropeSub-Saharan AfricaSub-Saharan AfricaAsiaCentral America and the CaribbeanAsiaEuropeAsiaSub-Saharan AfricaAsiaAsustralia and OceaniaEuropeEuropeCentral America and the CaribbeanAsiaIa and OceaniaAsiaSub-Saharan AfricaCentral America and the CaribbeanMiddle East and North AfricaSub-Saharan AfricaAsiaEuropeSub-Saharan AfricaMiddle East and North AfricaSub-Saharan AfricaEuropeAsiaSub-Saharan AfricaEuropeEuropeEuropeEuropeSub-Saharan AfricaEuropeEuropeSub-Saharan AfricaMiddle East and North AfricaSub-Saharan AfricaSub-Saharan AfricaSub-Saharan AfricaAsiaEuropeEuropeSub-Saharan AfricaAsiaEuropeEuropeSub-Saharan AfricaAsiaEuropeEuropeSub-Saharan AfricaSub-Saharan AfricaMiddle East and North AfricaSub-Saharan Af

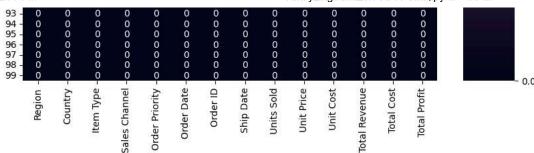
Next steps: Explain error

data['Total Cost']= data['Total Cost'].astype('Float64')

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Order ID	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Tota Profi
0	Australia and Oceania	Tuvalu	Baby Food	Offline	Н	2010- 05-28	669165933	2010- 06-27	9925	255.28	159.42	2533654.00	<na></na>	951410.
1	Central America and the Caribbean	Grenada	Cereal	Online	С	2012- 08-22	963881480	2012- 09-15	2804	205.70	117.11	576782.80	328376.44	248406.
2	Europe	Russia	Office Supplies	Offline	L	2014- 05-02	341417157	2014- 05-08	1779	651.21	524.96	1158502.59	933903.84	224598.
3	Sub- Saharan Africa	Sao Tome and Principe	Fruits	Online	С	2014- 06-20	514321792	2014- 07-05	8102	9.33	6.92	75591.66	56065.84	19525.
4	Sub- Saharan Africa	Rwanda	Office Supplies	Offline	L	2013- 02-01	115456712	2013- 02-06	5062	651.21	524.96	3296425.02	2657347.52	639077
95	Sub- Saharan Africa	Mali	Clothes	Online	М	2011- 07-26	512878119	2011- 09-03	888	109.28	35.84	97040.64	31825.92	65214.
96	Asia	Malaysia	Fruits	Offline	L	2011- 11-11	810711038	2011- 12-28	6267	9.33	6.92	58471.11	43367.64	15103
97	Sub- Saharan Africa	Sierra Leone	Vegetables	Offline	С	2016- 06-01	728815257	2016- 06-29	1485	154.06	90.93	228779.10	135031.05	93748
Q Q	North	Mavico	Personal	Offlina	N.A	2015-	550/27106	2015-	5767	Ω1 72	56 67	/7122 <u>6</u> 01	326 <u>81</u> 5 <u>80</u>	1//521

plt.figure(figsize=(10,20))
sns.heatmap(data.isnull(),annot= True) # NO NULL VALUES





data.head(3)

→		Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Order ID	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	
	0	Australia and Oceania	Tuvalu	Baby Food	Offline	Н	2010- 05-28	669165933	2010- 06-27	9925	255.28	159.42	2533654.00	<na></na>	951410.50	
	1 '	Central America and the aribbean	Grenada	Cereal	Online	С	2012- 08-22	963881480	2012- 09-15	2804	205.70	117.11	576782.80	328376.44	248406.36	
		Europo.	Pussis	Office	Offlina_		2014-	241417157	2014-	1770_	<u>651 91</u>	£24.06	1159502 50	_033003_84_	224509.75	
Next	steps:	Genera	ate code with	data	• Vie	ew recomme	nded plo	ts New	interact	ive sheet						

Data Analysis:

Queries:

Which regions have the highest total sales revenue?

What is the average unit price and unit cost for each item type?

Which country has the highest total profit?

How does the sales channel affect the order priority distribution?

What is the average order processing time (duration between order and ship dates) for each sales channel?

Which item types have the highest and lowest total sales?

How does the order priority vary across different regions?

What is the correlation between unit price and total profit?

Are there any seasonal trends or patterns in the sales data?

How does the number of units sold vary across different countries?

1- Which regions have the highest total sales revenue?

1e7 is scientific form. it means 1*10**7= 10,000,000



2- What is the average unit price and unit cost for each item type?

Avg_Unit_Price= data.groupby(data['Item Type'])['Unit Price'].mean() Avg_Unit_Cost= data.groupby(data['Item Type'])['Unit Cost'].mean()

Avg_Price_Cost= pd.DataFrame({'Average Unit Price': Avg_Unit_Price, 'Average Unit Cost': Avg_Unit_Cost})

	5	<u></u>
ice_Cost		
	Average Unit Price	Average Unit Cost
Item Type		
Baby Food	255.28	159.42
Beverages	47.45	31.79
Cereal	205.70	117.11
Clothes	109.28	35.84
Cosmetics	437.20	263.33
Fruits	9.33	6.92
Household	668.27	502.54
Meat	421.89	364.69
Office Supplies	651.21	524.96
Personal Care	81.73	56.67
Snacks	152.58	97.44
Vegetables	154.06	90.93

Next steps: Generate code with Avg_Price_Cost View recommended plots

New interactive sheet

→

3- Which country has the highest total profit?

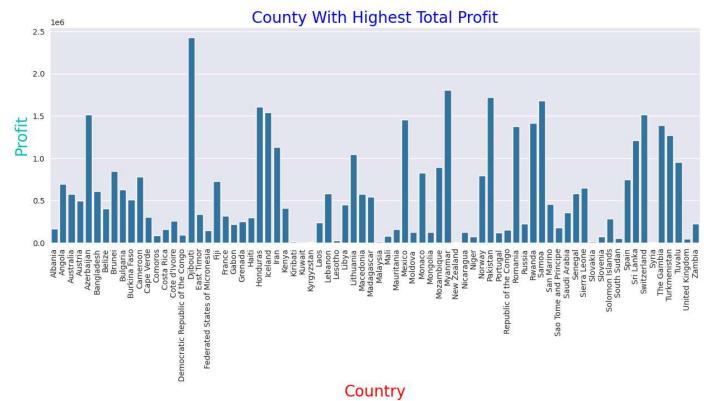
```
Total_Profit_By_Comapany= data.groupby(data['Country']) ['Total Profit'].sum()
Highest_Total_Profit_County= Total_Profit_By_Comapany.idxmax()

print("Country with the highest total profit:",Highest_Total_Profit_County)

Country with the highest total profit: Djibouti

group_data= data.groupby(data['Country']) ['Total Profit'].sum()
sns.set_style('darkgrid')
plt.figure(figsize=(15,5))
sns.barplot(x= group_data.index, y= group_data )

plt.xticks(rotation= 90)
plt.title('Country With Highest Total Profit', fontsize= 20, color= 'Blue')
plt.xlabel('Country', fontsize= 20, color= 'red')
plt.ylabel('Profit', fontsize= 20, color= 'c')
plt.show()
```



4- How does the sales channel affect the order priority distribution?

Sales_Channel_Order_Priority_Distribution= data.groupby(data['Sales Channel']) ['Order Priority'].value_counts() Sales_Channel_Order_Priority_Distribution



count

Sales Channel	Order Priority	
Offline	Н	17
	С	13
	L	12
	М	8
Online	L	15
	Н	13
	М	13
	С	9

dtype: int64

```
Sales_Channel_Order_Priority_Distribution = data.groupby(['Sales Channel', 'Order Priority'])['Order Priority'].count()
# Reset the index to convert the grouped data into a DataFrame
Sales_Channel_Order_Priority_Distribution = Sales_Channel_Order_Priority_Distribution.reset_index(name='Count')
# Set the style
sns.set_style('darkgrid')
# Create the bar plot
plt.figure(figsize=(10, 6))
sns.barplot(x='Sales Channel', y='Count', hue='Order Priority', data=Sales_Channel_Order_Priority_Distribution)
# Add labels and title
plt.xlabel('Sales Channel')
plt.ylabel('Count')
plt.title('Sales Channel Order Priority Distribution')
# Display the plot
plt.show()
```

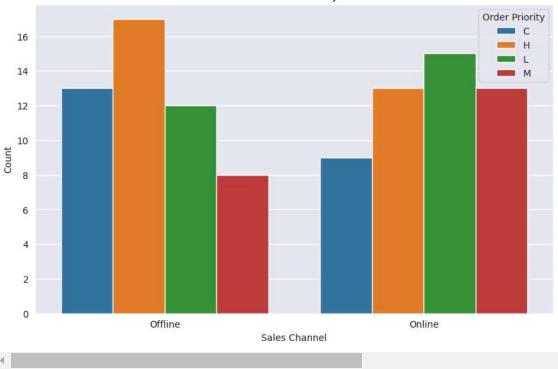
🧦 /usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key) /usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p

data_subset = grouped_data.get_group(pd_key)

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)

Sales Channel Order Priority Distribution



5- What is the average order processing time (duration between order and ship dates) for each sales channel?

```
data['Processing Time'] = data['Ship Date'] - data['Order Date']
Avg_Processing_Time= data.groupby(data['Sales Channel'])['Processing Time'].mean()
Avg_Processing_Time
₹
                     Processing Time
```

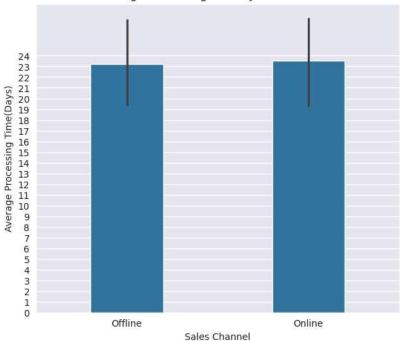
Sales Channel Offline 23 days 04:48:00 Online 23 days 12:28:48

dtype: timedelta64[ns]

```
plt.figure(figsize=(7, 6))
sns.barplot(data= data, x= data['Sales Channel'], y=data['Processing Time'].dt.days, width= 0.4 )
plt.title('Average Processing Time by Sales Channel')
plt.xlabel('Sales Channel')
plt.yticks(np.arange(0,25,1))
plt.ylabel('Average Processing Time(Days)')
plt.show()
```



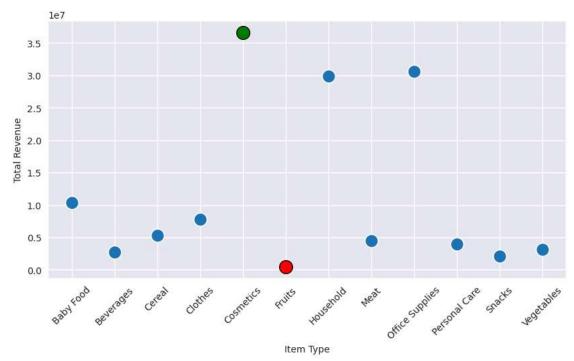




6- Which item types have the highest and lowest total sales?

```
group_item_type= data.groupby(data['Item Type'])['Total Revenue'].sum()
highest_sales_revenue_item_type= group_item_type.idxmax()
lowest_sales_revenue_item_type= group_item_type.idxmin()
print("{'Highest Sales Revenue By Item Type':", highest_sales_revenue_item_type, "\n'Lowest Sales Revenue By Item Type':", lowest_sales_reve
    {'Highest Sales Revenue By Item Type': Cosmetics
     'Lowest Sales Revenue By Item Type': Fruits }
plt.figure(figsize=(10,5))
# Highlight Max Value
sns.scatterplot(x=group_item_type.index, y=group_item_type, s=200)
max_index = group_item_type.idxmax()
plt.scatter(x=max_index, y=group_item_type[max_index], s=200, color='Green', edgecolor='black')
# Highlight the minimum value
min_index = group_item_type.idxmin()
\verb|plt.scatter(x=min\_index, y=group\_item\_type[min\_index], s=200, color='RED', edgecolor='black')| \\
plt.yticks(rotation= 0)
plt.xticks(rotation= 45)
plt.show()
```





7- How does the order priority vary across different regions?

Diff_regions_by_order_priority= data.groupby(data['Region'])['Order Priority'].value_counts() Diff_regions_by_order_priority



count

Region	Order Priority	
Asia	L	4
	н	3
	С	2
	M	2
Australia and Oceania	н	5
	С	4
	L	1
	М	1
Central America and the Caribbean	С	2
	н	2
	L	2
	М	1
Europe	н	7
	L	6
	С	5
	М	4
Middle East and North Africa	L	4
	М	4
	н	2
North America	С	1
	L	1
	М	1
Sub-Saharan Africa	Н	11
	L	9
	С	8
	М	8

dtype: int64

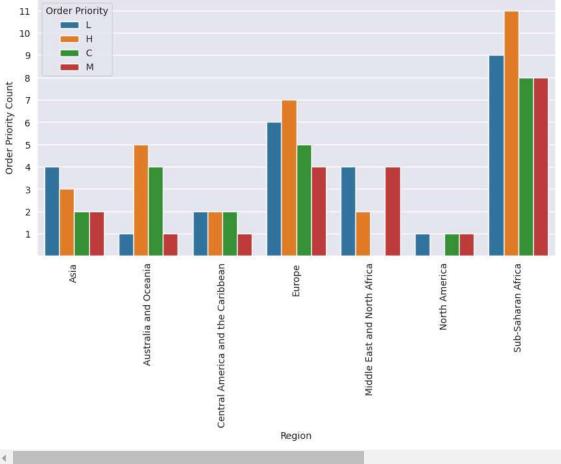
```
Diff_regions_by_order_priority= data.groupby(data['Region'])['Order Priority'].value_counts().reset_index(name='Order Priority Count')
plt.figure(figsize= (10,5))
sns.barplot(data= Diff_regions_by_order_priority, x= 'Region', y= 'Order Priority Count', hue= 'Order Priority')
plt.xticks(rotation= 90)
plt.yticks(np.arange(1,12,1))
plt.show()
```

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)

/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949: FutureWarning: When grouping with a length-1 list-like, you will need to p data_subset = grouped_data.get_group(pd_key)



8- What is the correlation between unit price and total profit?

```
Correlation_Unit_Price_Total_Profit= data['Unit Price'].corr(data['Total Profit'])

print("Correlation between Unit Price and Total Profit:", Correlation_Unit_Price_Total_Profit)

Correlation between Unit Price and Total Profit: 0.5573652488121267

plt.figure(figsize=(4,2))
plt.scatter(x= Correlation_Unit_Price_Total_Profit, y= Correlation_Unit_Price_Total_Profit, s= 200, color= 'RED')
plt.xticks(np.arange(-1,2,0.5))
plt.yticks(np.arange(-1,2,0.5))
plt.title('Correlation_Unit_Price_Total_Profit')

plt.show
```

```
matplotlib.pyplot.show
def show(*args, **kwargs)

/usr/local/lib/python3.10/dist-packages/matplotlib/pyplot.py
Display all open figures.

Parameters
-----
block: bool, optional
```



9- Are there any seasonal trends or patterns in the sales data?

₹

Total Revenue

Order Date	
JAN	10482467.12
FEB	24740517.77
MAR	2274823.87
APR	16187186.33
MAY	13215739.99
JUN	5230325.77
JUL	15669518.50
AUG	1128164.91
SEPT	5314762.56
ОСТ	15287576.61
NOV	20568222.76
DEC	7249462.12

dtype: float64

```
sns.barplot(x= monthly_sales.index, y= monthly_sales)
plt.title('Month Wise Total Revenue')
plt.xlabel('Month')
plt.ylabel('Total Revenue')
plt.show()
```





10- How does the number of units sold vary across different countries?

Diff_countries_by_unit_sold= data.groupby(data['Country'])['Units Sold'].sum().reset_index(name= 'Unit Sold')
pd.set_option('display.max_rows',None)
Diff_countries_by_unit_sold

 \blacksquare

	Country	Unit Sol
0	Albania	226
1	Angola	418
2	Australia	1299
3	Austria	284
4	Azerbaijan	925
5	Bangladesh	826
6	Belize	549
7	Brunei	670
8	Bulgaria	566
9	Burkina Faso	808
10	Cameroon	1094
11	Cape Verde	416
12	Comoros	96
13	Costa Rica	640
14	Cote d'Ivoire	348
15	Democratic Republic of the Congo	574
16	Djibouti	2319
17	East Timor	590
18	Federated States of Micronesia	937
19	Fiji	990
20	France	181
21	Gabon	865
22	Grenada	280
23	Haiti	170
24	Honduras	1119
25	Iceland	886
26	I ran	648
27	Kenya	645
28	Kiribati	539
29	Kuwait	52
30	Kyrgyzstan	12
31	Laos	373
32	Lebanon	788
33	Lesotho	960
34	Libya	678
35	Lithuania	828
36	Macedonia	784
37	Madagascar	734
38	Malaysia	626
39	Mali 	671
40	Mauritania	126
41	Mexico	1914
42	Moldova	507
43	Monaco	861

45

5367

Mozambique