In [125…

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

In [126…

```
df= pd.read_csv("amazon_sales_dataset.csv")
```

In [127…

```
sns.set(style="white")
```

In [128…

```
df
```

Out[128…

	order_id	order_date	product_id	product_category	price	discount_percent	quantity_sold	customer_region	payment_method	rati
0	1	2022-04-13	2637	Books	128.75	10	4	North America	UPI	3
1	2	2023-03-12	2300	Fashion	302.60	20	5	Asia	Credit Card	3
2	3	2022-09-28	3670	Sports	495.80	20	2	Europe	UPI	4
3	4	2022-04-17	2522	Books	371.95	15	4	Middle East	UPI	5
4	5	2022-03-13	1717	Beauty	201.68	0	4	Middle East	UPI	4
...	...	...	...	...	...	...	...	...	...	
49995	49996	2022-09-03	1433	Beauty	26.99	0	5	Middle East	Credit Card	2
49996	49997	2022-07-03	1428	Beauty	294.23	10	5	Asia	Credit Card	3
49997	49998	2023-02-17	4651	Electronics	352.11	30	4	Asia	Debit Card	3
49998	49999	2022-09-30	4371	Beauty	307.54	5	1	Middle East	UPI	1
49999	50000	2023-06-29	2944	Home & Kitchen	253.44	30	1	Europe	Debit Card	2

50000 rows × 13 columns

In [129…

```
#checking data types
df.dtypes
```

Out[129…

```
order_id              int64
order_date           object
product_id            int64
product_category     object
price               float64
discount_percent      int64
quantity_sold         int64
customer_region      object
payment_method       object
rating              float64
review_count          int64
discounted_price    float64
total_revenue       float64
dtype: object
```

In [130…

```
#converting from object to datetime
df["order_date"]= pd.to_datetime(df["order_date"])
```

In [131…

```
#checking for null values
df.isnull().sum()
```

Out[131…

```
order_id            0
order_date          0
product_id          0
product_category    0
price               0
discount_percent    0
quantity_sold       0
customer_region     0
payment_method      0
rating              0
review_count        0
discounted_price    0
total_revenue       0
dtype: int64
```

In [132…

```
#checking for duplicates
df.duplicated().sum()
```

Out[132…

```
np.int64(0)
```

In [133…

```
#Validate Pricing Columns
df.assign(calculated_discount = df["price"] * (1- df["discount_percent"]/100).round(2))
```

Out[133…

	order_id	order_date	product_id	product_category	price	discount_percent	quantity_sold	customer_region	payment_method	ratii
0	1	2022-04-13	2637	Books	128.75	10	4	North America	UPI	3
1	2	2023-03-12	2300	Fashion	302.60	20	5	Asia	Credit Card	3
2	3	2022-09-28	3670	Sports	495.80	20	2	Europe	UPI	4
3	4	2022-04-17	2522	Books	371.95	15	4	Middle East	UPI	5
4	5	2022-03-13	1717	Beauty	201.68	0	4	Middle East	UPI	4
...	...	...	...	...	...	...	...	...	...	
49995	49996	2022-09-03	1433	Beauty	26.99	0	5	Middle East	Credit Card	2
49996	49997	2022-07-03	1428	Beauty	294.23	10	5	Asia	Credit Card	3
49997	49998	2023-02-17	4651	Electronics	352.11	30	4	Asia	Debit Card	3
49998	49999	2022-09-30	4371	Beauty	307.54	5	1	Middle East	UPI	1
49999	50000	2023-06-29	2944	Home & Kitchen	253.44	30	1	Europe	Debit Card	2

50000 rows × 14 columns

In [134…

```
#creating year column from order_date
df["year"]= df["order_date"].dt.year
```

In [135…

```
#creating month column from order date
df["month"] = df["order_date"].dt.month
```

In [136…

```
df["month_name"]= df["order_date"].dt.month_name()
df["week"]= df["order_date"].dt.day_name()
```

In [137…

```
#checking for uniuqe values
df["product_category"].unique()
```

Out[137…

```
array(['Books', 'Fashion', 'Sports', 'Beauty', 'Electronics',
       'Home & Kitchen'], dtype=object)
```

In [138…

```
#checking for uniuqe values
df["payment_method"].unique()
```

Out[138…

```
array(['UPI', 'Credit Card', 'Wallet', 'Cash on Delivery', 'Debit Card'],
      dtype=object)
```

In [139…

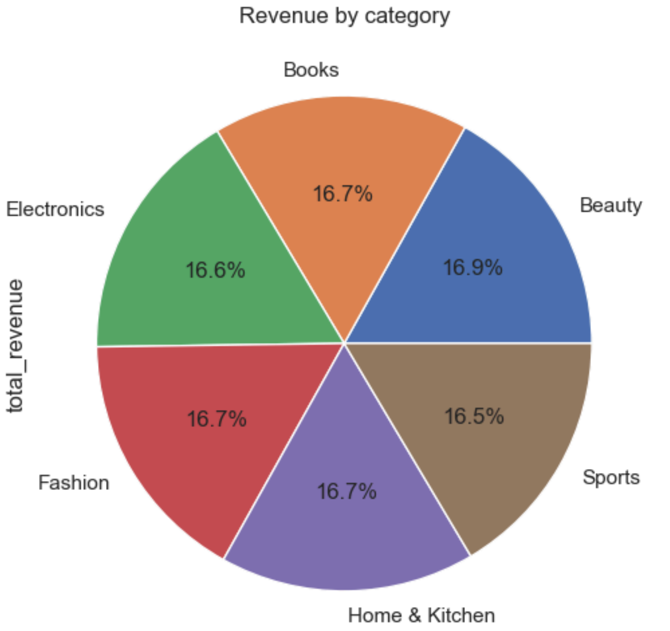
```
#Total Revenue by Category
df.groupby("product_category")["total_revenue"].agg(average_revenue = "mean")
```

Out[139…

	total_revenue	average_revenue
product_category		
Beauty	5550624.97	655.714704
Books	5484863.03	658.684164
Electronics	5470594.03	657.523321
Fashion	5480123.34	655.125325
Home & Kitchen	5473132.55	662.767323
Sports	5407235.82	654.233009

In [161…

```
revenue_by_category= df.groupby("product_category")["total_revenue"].sum()
revenue_by_category.plot(kind='pie', autopct='%1.1f%%', figsize=(6,6))
plt.title("Revenue by category")
plt.show()
```



In [160…

```
#Total Prodcuts sold by category
products_sold_category= df.groupby("product_category")["quantity_sold"].sum().sort_values()
products_sold_category
```

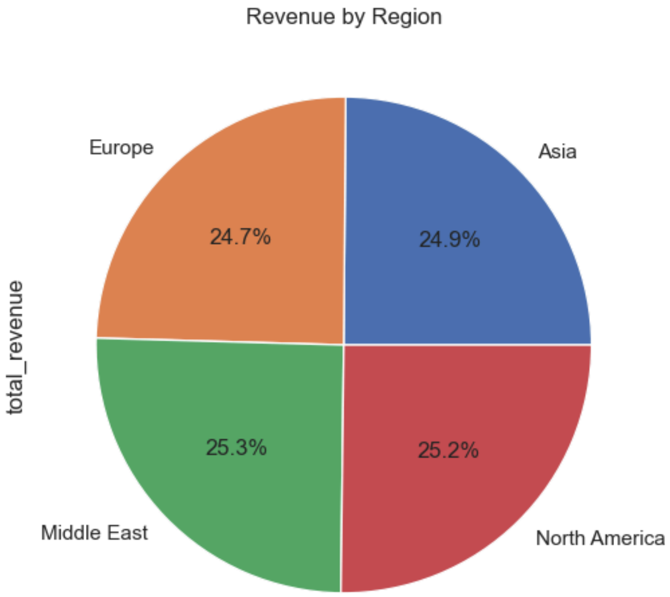
Out[160…

```
product_category
Home & Kitchen    24743
Sports            24753
Electronics       24898
Books             25065
Fashion           25089
Beauty            25422
Name: quantity_sold, dtype: int64
```

In [141…

```
#revenue by Region
region_revenue= df.groupby("customer_region")["total_revenue"].sum()

region_revenue.plot(kind='pie', autopct='%1.1f%%', figsize=(6,6))
plt.title("Revenue by Region")
plt.show()
```



In [142…

```
#products sold by region
df.groupby("customer_region")["quantity_sold"].sum()
```

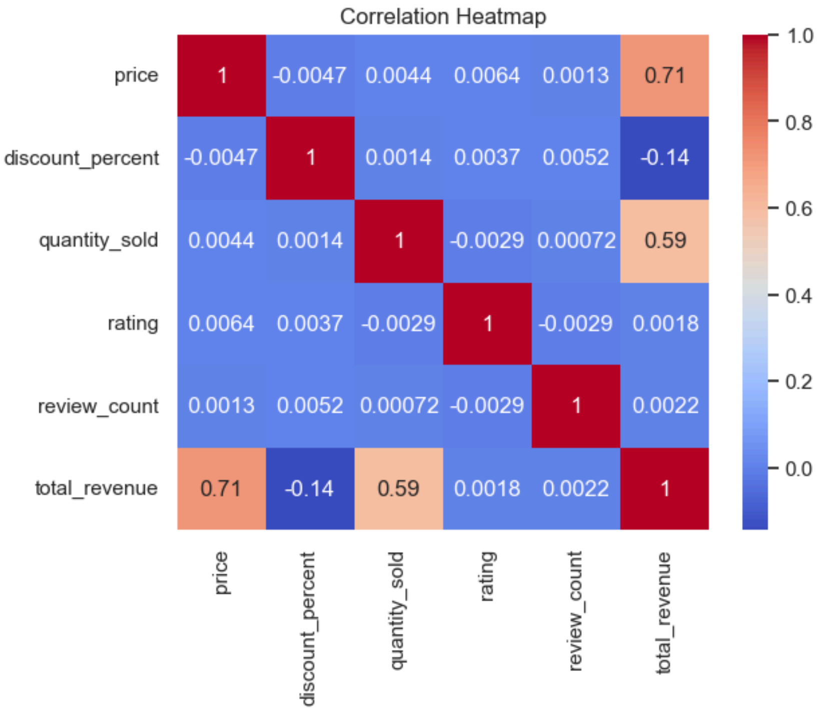
Out[142…

```
customer_region
Asia             37440
Europe           37302
Middle East      37694
North America    37534
Name: quantity_sold, dtype: int64
```

In [171…

```
num_cols = [
    'price','discount_percent','quantity_sold',
    'rating','review_count','total_revenue'
]

sns.heatmap(df[num_cols].corr(), annot=True, cmap='coolwarm')
plt.title("Correlation Heatmap")
plt.show()
```



In [143…

```
df.head()
```

Out[143…

	order_id	order_date	product_id	product_category	price	discount_percent	quantity_sold	customer_region	payment_method	rating	r
0	1	2022-04-13	2637	Books	128.75	10	4	North America	UPI	3.5	
1	2	2023-03-12	2300	Fashion	302.60	20	5	Asia	Credit Card	3.7	
2	3	2022-09-28	3670	Sports	495.80	20	2	Europe	UPI	4.4	
3	4	2022-04-17	2522	Books	371.95	15	4	Middle East	UPI	5.0	
4	5	2022-03-13	1717	Beauty	201.68	0	4	Middle East	UPI	4.6	

In [144…

```
#Average Rating by Products_category
df.groupby("product_category")["rating"].mean()
```

Out[144…

```
product_category
Beauty            2.985186
Books             3.020259
Electronics       2.991298
Fashion           2.987782
Home & Kitchen    2.996706
Sports            2.996891
Name: rating, dtype: float64
```

In [145…

```
#Revenue by payment_method
df.groupby("payment_method")["total_revenue"].agg(total_revenue= "sum",
                                                  average_revenue = "mean")
```

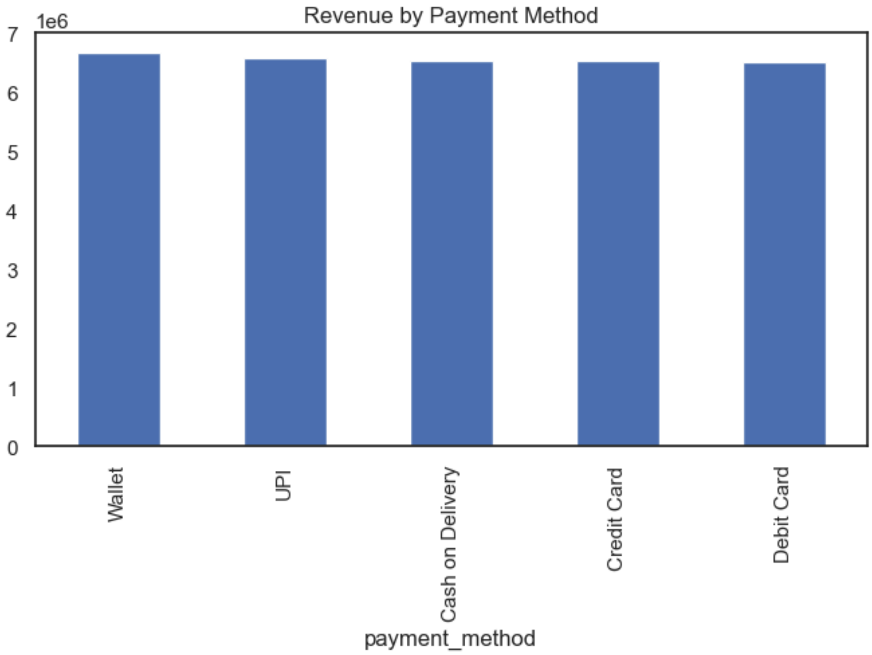
Out[145...

	total_revenue	average_revenue
payment_method		
Cash on Delivery	6546386.94	659.452699
Credit Card	6540087.16	660.081465
Debit Card	6522019.73	653.443516
UPI	6579441.44	652.851899
Wallet	6678638.47	660.858744

In [146...

```
payment_revenue = df.groupby("payment_method")["total_revenue"].sum().sort_values(ascending= False)

payment_revenue.plot(kind='bar', figsize=(8,4))
plt.title("Revenue by Payment Method")
plt.show()
```



In [147...

```
#average ratings by region
df.groupby("customer_region")["rating"].mean()
```

Out[147...

```
customer_region
Asia             2.995721
Europe           2.973651
Middle East      3.015434
North America    3.000360
Name: rating, dtype: float64
```

In [148...

```
#year wise Revenue
df.groupby("year")["total_revenue"].sum()
```

Out[148...

```
year
2022    16389404.56
2023    16477169.18
Name: total_revenue, dtype: float64
```

In [149...

```
#montlhy sales in 2022
df[df["year"]==2022].groupby("month_name")["total_revenue"].agg(total_revenue="sum")
```

Out[149…

	total_revenue
month_name	
April	1371955.83
August	1449308.06
December	1386209.61
February	1266714.29
January	1419751.89
July	1346089.18
June	1352125.49
March	1392585.42
May	1374779.57
November	1291100.05
October	1334818.11
September	1403967.06

In [150…

```
#montlhy sales in 2023
df[df["year"]==2023].groupby("month_name")["total_revenue"].agg(total_revenue="sum")
```

Out[150…

	total_revenue
month_name	
April	1307017.94
August	1396321.88
December	1335185.33
February	1238380.51
January	1464174.99
July	1442176.66
June	1394822.13
March	1366418.41
May	1431398.77
November	1334328.47
October	1425936.23
September	1341007.86

In [170…

```
#Orders by weekday
df.groupby("week")["order_id"].sum()
```

Out[170…

```
week
Friday       183031656
Monday       179137558
Saturday     176189881
Sunday       180541174
Thursday     179011561
Tuesday      177046396
Wednesday    175066774
Name: order_id, dtype: int64
```

In [152…

```
df["discount_percent"].unique()
```

Out[152…

```
array([10, 20, 15,  0, 30,  5])
```

In [153…

```
#creating discount buckets
bins = [0,10,20,30]
labels = ["low","medium","high"]

df["discount_group"]= pd.cut(df["discount_percent"], bins=bins , labels = labels, include_lowest=True)
df["discount_group"]
```

Out[153…

```
0           low
1        medium
2        medium
3        medium
4           low
          ...  
49995       low
49996       low
49997      high
49998       low
49999      high
Name: discount_group, Length: 50000, dtype: category
Categories (3, object): ['low' < 'medium' < 'high']
```

In [154…

```
#creating price buckets
labels = ["low","affordable","high","premium"]
df["price_group"]= pd.qcut(df["price"], q= 4, labels= labels)
df["price_group"]
```

Out[154…

```
0        affordable
1              high
2           premium
3              high
4        affordable
            ...    
49995           low
49996          high
49997          high
49998          high
49999          high
Name: price_group, Length: 50000, dtype: category
Categories (4, object): ['low' < 'affordable' < 'high' < 'premium']
```

In [155…

```
#creating review groups
labels = ["low","average","high"]
df["review_group"]= pd.qcut(df["rating"] , q=3 , labels= labels)
df["review_group"]
```

Out[155…

```
0        average
1        average
2           high
3           high
4           high
          ...   
49995    average
49996    average
49997    average
49998        low
49999        low
Name: review_group, Length: 50000, dtype: category
Categories (3, object): ['low' < 'average' < 'high']
```

In [165…

```
#rating vs revenue
rating_revenue = df.groupby("review_group", observed=False)["total_revenue"].sum()
rating_revenue
```

Out[165…

```
review_group
low        11224174.54
average    11318505.17
high       10323894.03
Name: total_revenue, dtype: float64
```

In [ ]: