```
from IPython.display import Image, display

# Display an image file
display(Image(filename='example.jpg'))
```

Amazon Sales Analysis

```
# Importing NumPy library and aliasing it as np
import numpy as np

# Importing Pandas library and aliasing it as pd
import pandas as pd

# Importing Matplotlib's pyplot module and aliasing it as plt
import matplotlib.pyplot as plt

# Importing Seaborn library and aliasing it as sns
import seaborn as sns

# Reading the CSV file "Amazon Sales data.csv" into a Pandas DataFrame
and setting the first column as the index
amz = pd.read_csv("Amazon Sales data.csv", index_col=0)

# Checking the shape of the DataFrame to see the number of rows and
columns
amz.shape
```

```
(100, 13)
```

```
# Displaying the first few rows of the DataFrame to get an overview of
the data
amz.head()
```

```
                                                Country         Item
Type  \
```

```
Region

Australia and Oceania                                Tuvalu        Baby
Food
Central America and the Caribbean                  Grenada
Cereal
Europe                                              Russia  Office
Supplies
Sub-Saharan Africa                   Sao Tome and Principe
Fruits
Sub-Saharan Africa                                  Rwanda  Office
Supplies

                                    Sales Channel Order Priority Order
Date  \
Region

Australia and Oceania                      Offline              H
5/28/2010
Central America and the Caribbean           Online              C
8/22/2012
Europe                                     Offline              L
5/2/2014
Sub-Saharan Africa                          Online              C
6/20/2014
Sub-Saharan Africa                         Offline              L
2/1/2013

                                      Order ID  Ship Date  Units Sold  \
Region
Australia and Oceania                669165933  6/27/2010        9925
Central America and the Caribbean    963881480  9/15/2012        2804
Europe                               341417157   5/8/2014        1779
Sub-Saharan Africa                   514321792   7/5/2014        8102
Sub-Saharan Africa                   115456712   2/6/2013        5062

                                     Unit Price  Unit Cost  Total
Revenue  \
Region

Australia and Oceania                    255.28     159.42
2533654.00
Central America and the Caribbean        205.70     117.11
576782.80
Europe                                   651.21     524.96
1158502.59
Sub-Saharan Africa                         9.33       6.92
75591.66
Sub-Saharan Africa                       651.21     524.96
3296425.02
```

```
                                  Total Cost  Total Profit
Region
Australia and Oceania             1582243.50     951410.50
Central America and the Caribbean  328376.44     248406.36
Europe                             933903.84     224598.75
Sub-Saharan Africa                  56065.84      19525.82
Sub-Saharan Africa                2657347.52     639077.50
```

TOTAL SALES

```
# Calculating the total sales by summing up the 'Total Revenue' column and rounding it to 2 decimal places
Total_Sales = round((amz['Total Revenue'].sum()/1000000),2)

# Printing the total sales in millions with appropriate formatting
print("Total Sales : $ {} M".format(Total_Sales))
```

```
Total Sales : $ 137.35 M
```

TOTAL COST

```
# Calculating the total cost by summing up the 'Total Cost' column and rounding it to 2 decimal places
Total_Cost = round((amz['Total Cost'].sum()/1000000),2)

# Printing the total cost in millions with appropriate formatting
print("Total Cost : $ {} M".format(Total_Cost))
```

```
Total Cost : $ 93.18 M
```

TOTAL PROFIT

```
# Calculating the total profit by summing up the 'Total Profit' column and rounding it to 2 decimal places
Total_Profit = round((amz['Total Profit'].sum()/1000000),2)

# Printing the total profit in millions with appropriate formatting
print("Total Profit : $ {} M".format(Total_Profit))
```

```
Total Profit : $ 44.17 M
```

TOTAL UNITS SOLD

```
# Calculating the total units sold by summing up the 'Units Sold' column
Total_Units_Sold = amz['Units Sold'].sum()

# Printing the total units sold
print("Total Units Sold : {}".format(Total_Units_Sold))
```

```
Total Units Sold : 512871
```

TOTAL ORDERS COUNT

```
# Counting the total number of orders by counting the unique values in
the 'Order ID' column
Total_orders = amz['Order ID'].count()

# Printing the total number of orders
print("Total orders :", Total_orders)
```

```
Total orders : 100
```

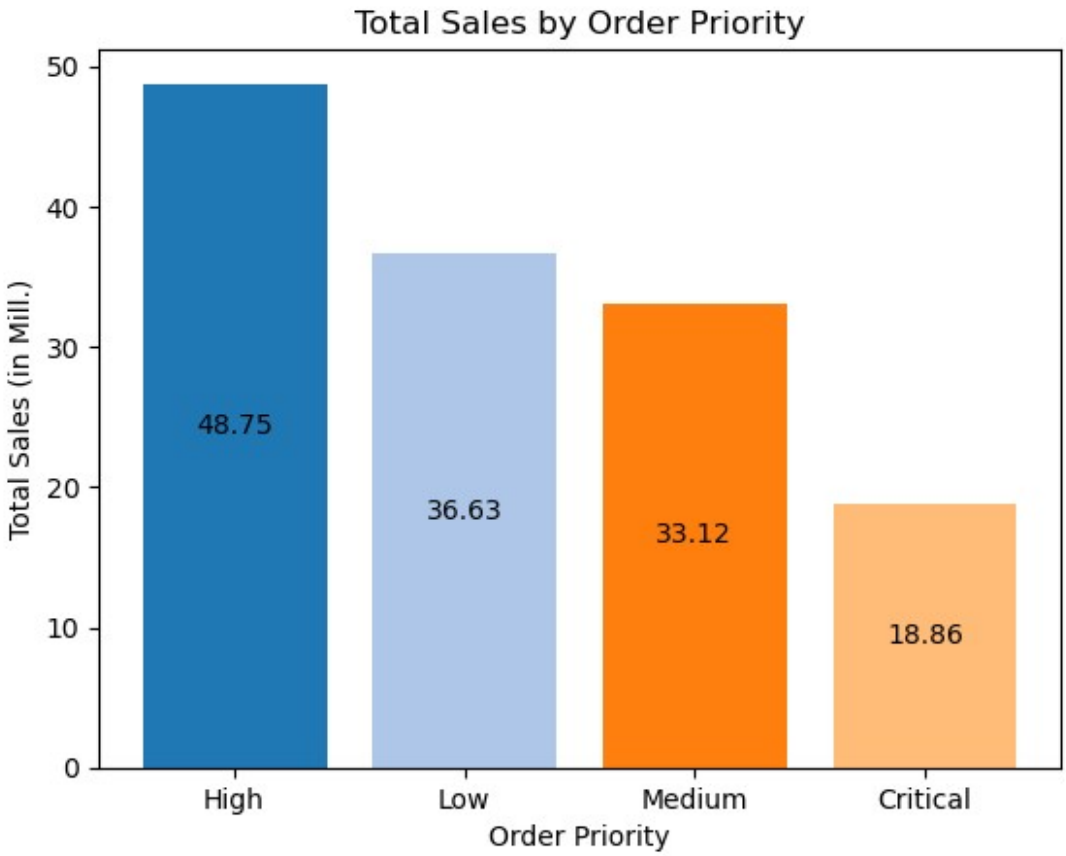
ORDER PRIORITY WISE SALES

```
# Mapping dictionary to convert priority codes to their corresponding
names
Priority_abbr = { 'C' : 'Critical' , 'H' : 'High' , 'L' : 'Low' ,
'M' : 'Medium'}

# Grouping the DataFrame by 'Order Priority' and calculating the sum
of 'Total Revenue'
Priority_wise = amz.groupby('Order Priority')['Total Revenue'].sum()

# Converting the resulting Series to a DataFrame and resetting the
index to make 'Order Priority' a column
Priority_wise = Priority_wise.reset_index()

# Mapping the priority codes to their corresponding names using the
mapping dictionary 'Priority_abbr'
Priority_wise['Order Priority'] = Priority_wise['Order
Priority'].map(Priority_abbr)

# Converting 'Total Revenue' to million dollars and rounding off to
two decimal places
Priority_wise['Total Revenue'] = round(Priority_wise['Total Revenue']
/ 1000000, 2)

# Renaming the 'Total Revenue' column to 'Total Sales (in Mill.)'
Priority_wise.rename(columns={'Total Revenue': 'Total Sales (in
Mill.)'}, inplace=True)

# Sorting the DataFrame by 'Total Sales (in Mill.)' in descending
order
Priority_wise.sort_values(by='Total Sales (in Mill.)',
ascending=False, inplace=True)

# Printing the DataFrame
Priority_wise
```

```
  Order Priority  Total Sales (in Mill.)
1           High                   48.75
2            Low                   36.63
3         Medium                   33.12
0       Critical                   18.86
```

VISUALIZING ORDER PRIORITY WISE SALES

```
## Creating a bar plot to visualize total sales across different order priorities

# Creating a bar plot with 'Order Priority' on the x-axis and 'Total Sales (in Mill.)' on the y-axis
barplot = plt.bar(Priority_wise['Order Priority'], Priority_wise['Total Sales (in Mill.)'], color=plt.cm.tab20.colors)

# Adding data labels to the bars with center alignment and black color
plt.bar_label(barplot, labels=Priority_wise['Total Sales (in Mill.)'], label_type="center", color="black")

# Adding labels to the x-axis and y-axis
plt.xlabel('Order Priority')
plt.ylabel('Total Sales (in Mill.)')

# Adding a title to the plot
plt.title('Total Sales by Order Priority')

# Displaying the plot
plt.show()
```



ORDER PRIORITY WISE ORDER COUNT

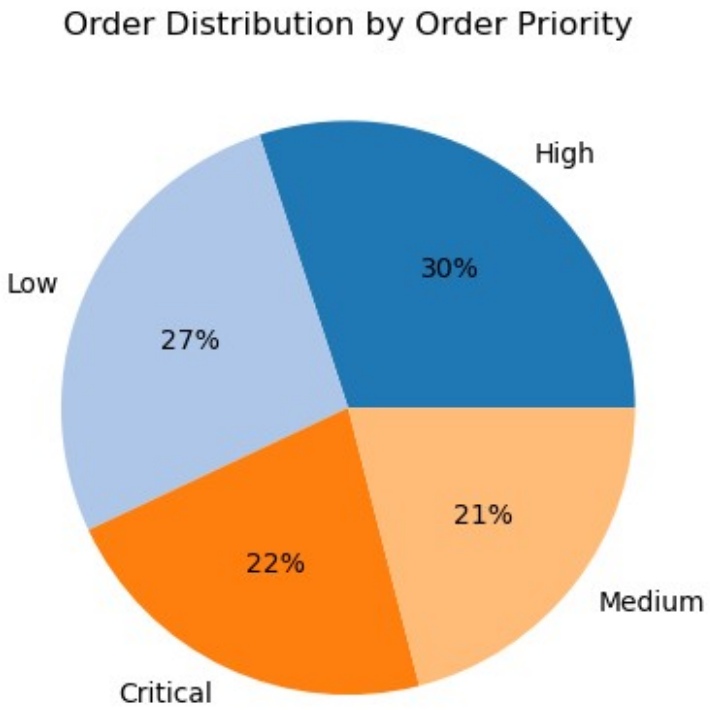
```
# Grouping by 'Order Priority' and counting the number of orders
('Order ID')
Priority_wise = amz.groupby('Order Priority')['Order ID'].count()

# Converting the resulting Series to a DataFrame and resetting the
index to make 'Order Priority' a column
Priority_wise = Priority_wise.reset_index()

# Mapping the priority codes to their corresponding names using the
mapping dictionary 'Priority_abbr'
Priority_wise['Order Priority'] = Priority_wise['Order
Priority'].map(Priority_abbr)

# Renaming the 'Order ID' column to 'Order Count'
Priority_wise.rename(columns={'Order ID': 'Order Count'},
inplace=True)

# Sorting the DataFrame by 'Order Count' in descending order
Priority_wise.sort_values(by='Order Count', ascending=False,
inplace=True)
```

```
# Printing the resulting DataFrame
Priority_wise
```

	Order Priority	Order Count
1	High	30
2	Low	27
0	Critical	22
3	Medium	21

VISUALIZING ORDER PRIORITY WISE ORDER DISTRIBUTION

```
# Creating a pie chart to visualize the distribution of orders by
order priority
pieplot = plt.pie(Priority_wise['Order Count'], labels =
Priority_wise['Order Priority'], autopct='%1.f%%',
colors=plt.cm.tab20.colors)

# Adding a title to the pie chart
plt.title('Order Distribution by Order Priority')

# Displaying the pie chart
plt.show()
```



YEAR WISE SALES

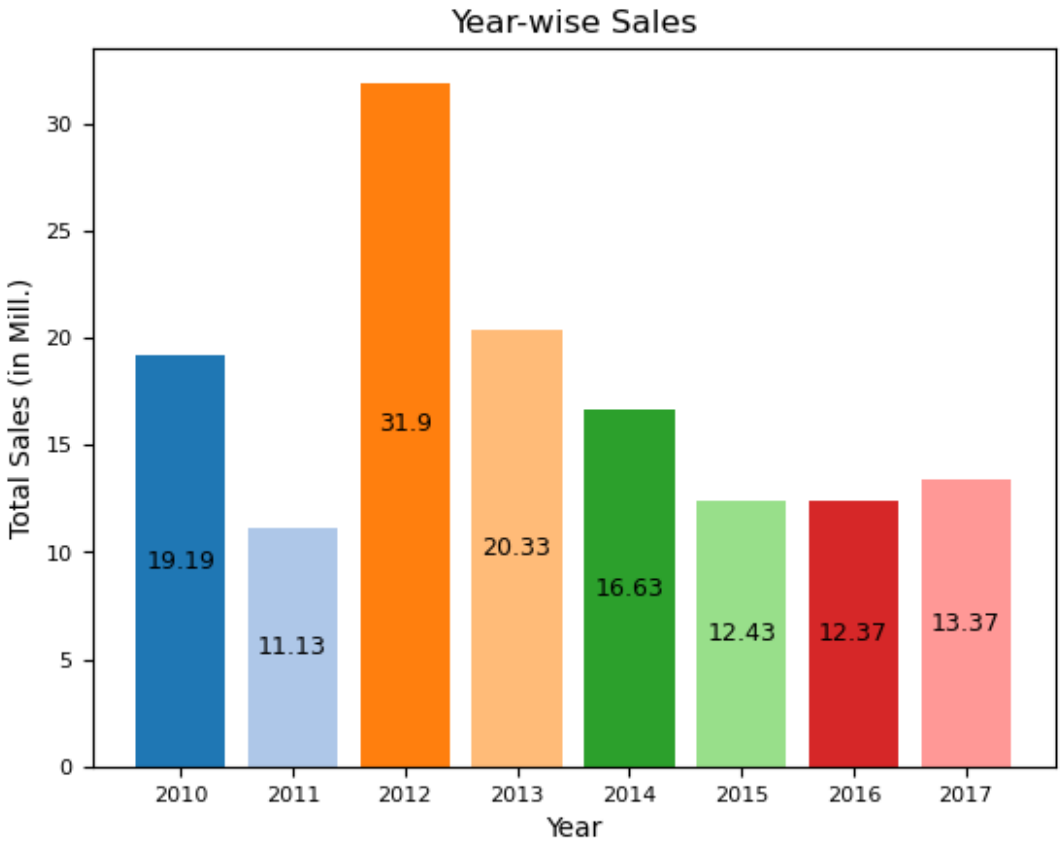
```
# Converting 'Order Date' and 'Ship Date' columns to datetime format
amz['Order Date'] = pd.to_datetime(amz['Order Date'])
amz['Ship Date'] = pd.to_datetime(amz['Ship Date'])

# Grouping the DataFrame by year from the 'Order Date' column and
summing the 'Total Revenue' column
Year_wise_Sales = amz.groupby(amz['Order Date'].dt.year)['Total
Revenue'].sum()

# Resetting the index to convert the resulting Series to a DataFrame
Year_wise_Sales = Year_wise_Sales.reset_index()

# Converting 'Total Revenue' to million dollars and rounding off to
two decimal places
Year_wise_Sales['Total Revenue'] = round(Year_wise_Sales['Total
Revenue'] / 1000000, 2)

# Renaming the columns for clarity
Year_wise_Sales.rename(columns={'Total Revenue': 'Total Sales (in
Mill.)', 'Order Date': 'Year'}, inplace=True)

# Displaying the resulting DataFrame
Year_wise_Sales
```

	Year	Total Sales (in Mill.)
0	2010	19.19
1	2011	11.13
2	2012	31.90
3	2013	20.33
4	2014	16.63
5	2015	12.43
6	2016	12.37
7	2017	13.37

VISUALIZING YEAR WISE SALES

```
# Creating a bar plot for year-wise total sales
barplot = plt.bar(Year_wise_Sales['Year'], Year_wise_Sales['Total
Sales (in Mill.)'], color=plt.cm.tab20.colors)

# Adding data labels to the bars at their centers
plt.bar_label(barplot, labels=Year_wise_Sales['Total Sales (in
Mill.)'], label_type="center", color="black", fontsize=9)

# Adding labels and title to the plot
plt.xlabel('Year')
plt.ylabel('Total Sales (in Mill.)')
plt.title('Year-wise Sales')
```

```
# Setting font sizes for the tick labels
plt.xticks(fontsize=8)
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



MONTH WISE SALES

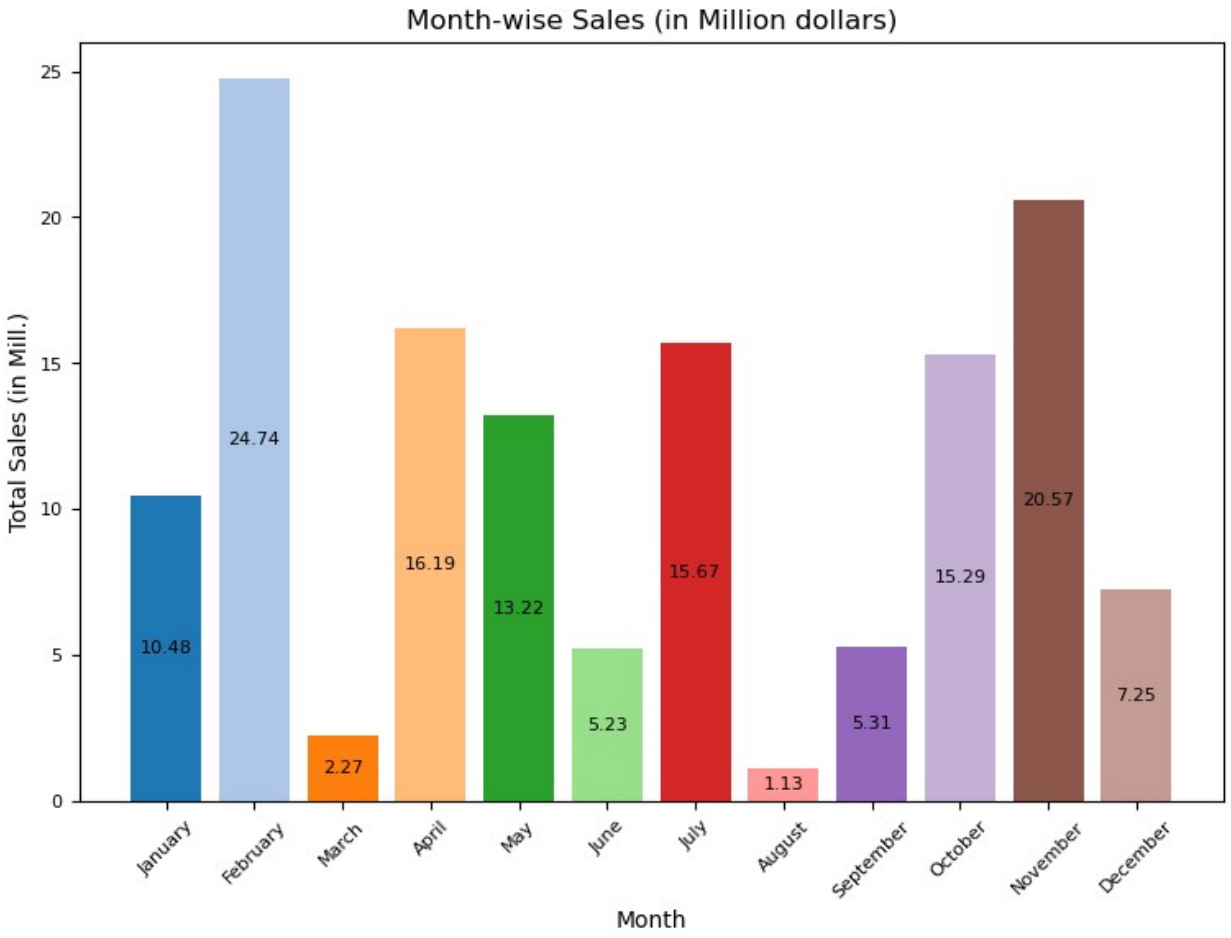
```
import calendar

# Grouping by month and summing the total revenue
Month_wise_Sales = amz.groupby(amz['Order Date'].dt.month)['Total
Revenue'].sum()

# Resetting the index to make 'Order Date' a column
Month_wise_Sales = Month_wise_Sales.reset_index()

# Converting total revenue to million dollars and rounding off to two
decimal places
Month_wise_Sales['Total Revenue'] = round(Month_wise_Sales['Total
Revenue'] / 1000000, 2)

# Renaming columns for clarity
```

```
Month_wise_Sales.rename(columns={'Order Date': 'Month', 'Total
Revenue': 'Total Sales (in Mill.)'}, inplace=True)

# Converting month numbers to month names
Month_wise_Sales['Month'] = Month_wise_Sales['Month'].apply(lambda x:
calendar.month_name[x])

# Displaying the DataFrame
Month_wise_Sales
```

	Month	Total Sales (in Mill.)
0	January	10.48
1	February	24.74
2	March	2.27
3	April	16.19
4	May	13.22
5	June	5.23
6	July	15.67
7	August	1.13
8	September	5.31
9	October	15.29
10	November	20.57
11	December	7.25

VISUALIZING MONTH WISE SALES

```
plt.figure(figsize=(9, 6))

# Creating the bar plot
barplot = plt.bar(Month_wise_Sales['Month'], Month_wise_Sales['Total
Sales (in Mill.)'], color=plt.cm.tab20.colors)

# Adding data labels to the bars
plt.bar_label(barplot, labels=Month_wise_Sales['Total Sales (in
Mill.)'], label_type="center", color="black", fontsize=8)

# Adding labels and title
plt.xlabel('Month')
plt.ylabel('Total Sales (in Mill.)')
plt.title('Month-wise Sales (in Million dollars)')

# Customizing ticks
plt.xticks(rotation=45, size=8)
plt.yticks(fontsize=8)

# Showing the plot
plt.show()
```



MONTH-YEAR WISE SALES

```
# Group by year and month, sum the 'Total Revenue' column, and reset
the index
Year_Month_wise_Sales = amz.groupby([amz['Order
Date'].dt.year.rename('Year'), amz['Order
Date'].dt.month.rename('Month')])['Total Revenue'].sum().reset_index()

# Convert the 'Total Revenue' to million dollars and round off to two
decimal places
Year_Month_wise_Sales['Total Revenue'] =
round(Year_Month_wise_Sales['Total Revenue'] / 1000000, 2)

# Map month numbers to month names
Year_Month_wise_Sales['Month'] =
Year_Month_wise_Sales['Month'].apply(lambda x: calendar.month_name[x])

# Rename the column 'Total Revenue' to 'Total Sales (in Mill.)'
Year_Month_wise_Sales.rename(columns={'Total Revenue': 'Total Sales
(in Mill.)'}, inplace=True)

# Define the order of months
```

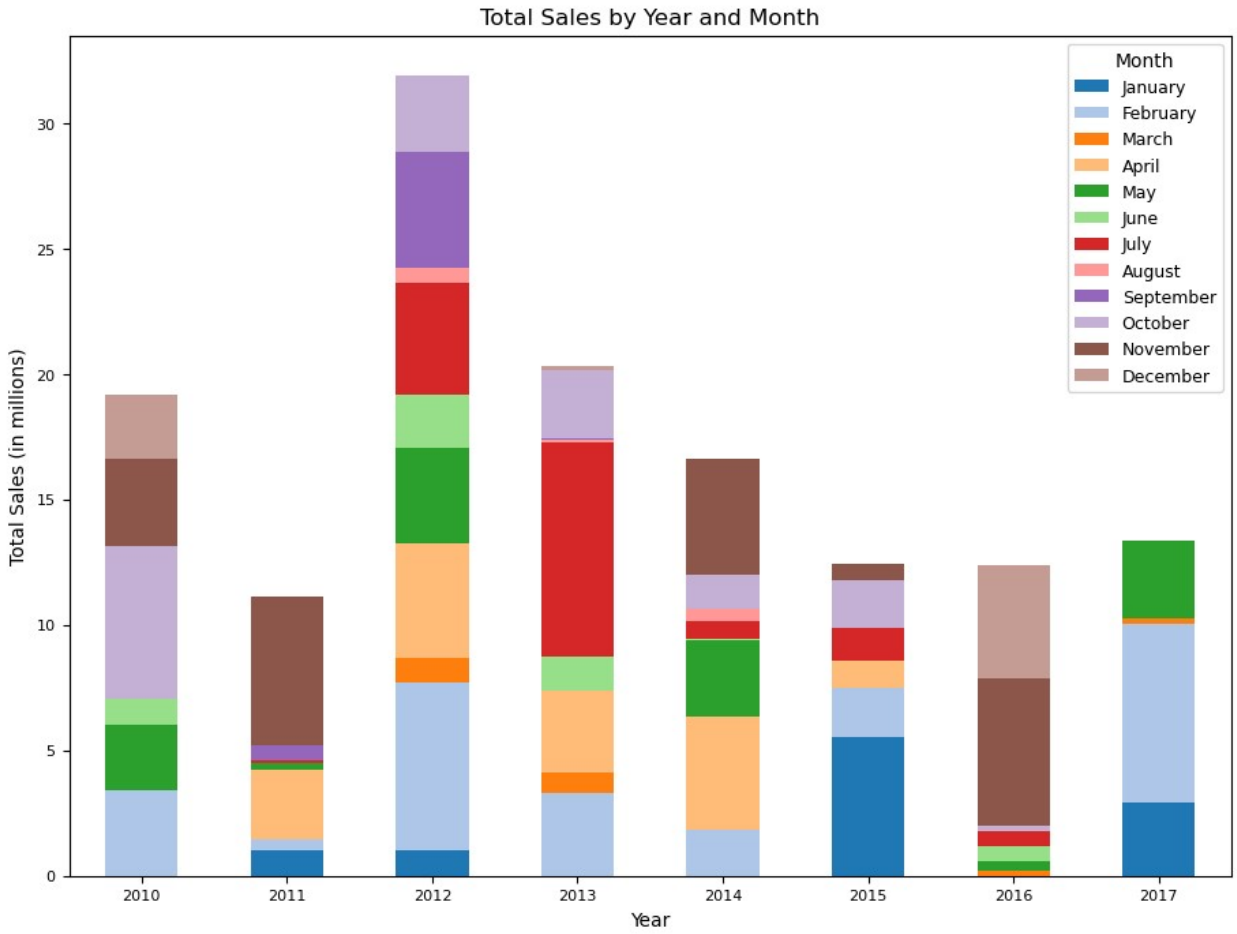
```
month_order = ['January', 'February', 'March', 'April', 'May', 'June',
'July', 'August', 'September', 'October', 'November', 'December']

# Set month column as categorical with the defined order
Year_Month_wise_Sales['Month'] =
pd.Categorical(Year_Month_wise_Sales['Month'], categories=month_order,
ordered=True)

# Pivot the DataFrame to have years as rows and months as columns
Year_Month_wise_Sales = Year_Month_wise_Sales.groupby(['Year',
'Month'])['Total Sales (in Mill.)'].sum().unstack()

# Display the resulting DataFrame
Year_Month_wise_Sales
```

Month	January	February	March	April	May	June	July	August	September
Year									
2010	0.00	3.41	0.00	0.00	2.59	1.08	0.00	0.00	0.00
2011	1.04	0.39	0.00	2.80	0.27	0.02	0.10	0.00	0.57
2012	1.01	6.71	0.99	4.56	3.78	2.13	4.45	0.58	4.65
2013	0.00	3.30	0.84	3.26	0.00	1.35	8.55	0.09	0.07
2014	0.00	1.82	0.00	4.51	3.06	0.08	0.69	0.46	0.02
2015	5.51	2.00	0.00	1.06	0.00	0.00	1.29	0.01	0.00
2016	0.00	0.00	0.20	0.00	0.41	0.57	0.60	0.00	0.00
2017	2.91	7.12	0.25	0.00	3.10	0.00	0.00	0.00	0.00

Month	October	November	December
Year			
2010	6.06	3.46	2.58
2011	0.00	5.94	0.00
2012	3.04	0.00	0.00
2013	2.70	0.00	0.17
2014	1.35	4.65	0.00
2015	1.90	0.65	0.00
2016	0.22	5.88	4.49
2017	0.00	0.00	0.00

VISUALIZING MONTH-YEAR WISE SALES

```
# Plot the stacked bar chart
stack_barplot = Year_Month_wise_Sales.plot(kind='bar', stacked=True,
figsize=(11, 8), color=plt.cm.tab20.colors)

# Customize the plot
plt.xlabel("Year")
plt.ylabel("Total Sales (in millions)")
plt.title("Total Sales by Year and Month")

# Add legend with title
plt.legend(title="Month", loc="upper right", fontsize=9)

# Rotate x-axis labels for better readability
plt.xticks(rotation=0, fontsize=8)
plt.yticks(fontsize=8)

# Display the plot
plt.show()
```



ITEM TYPE WISE UNITS SOLD

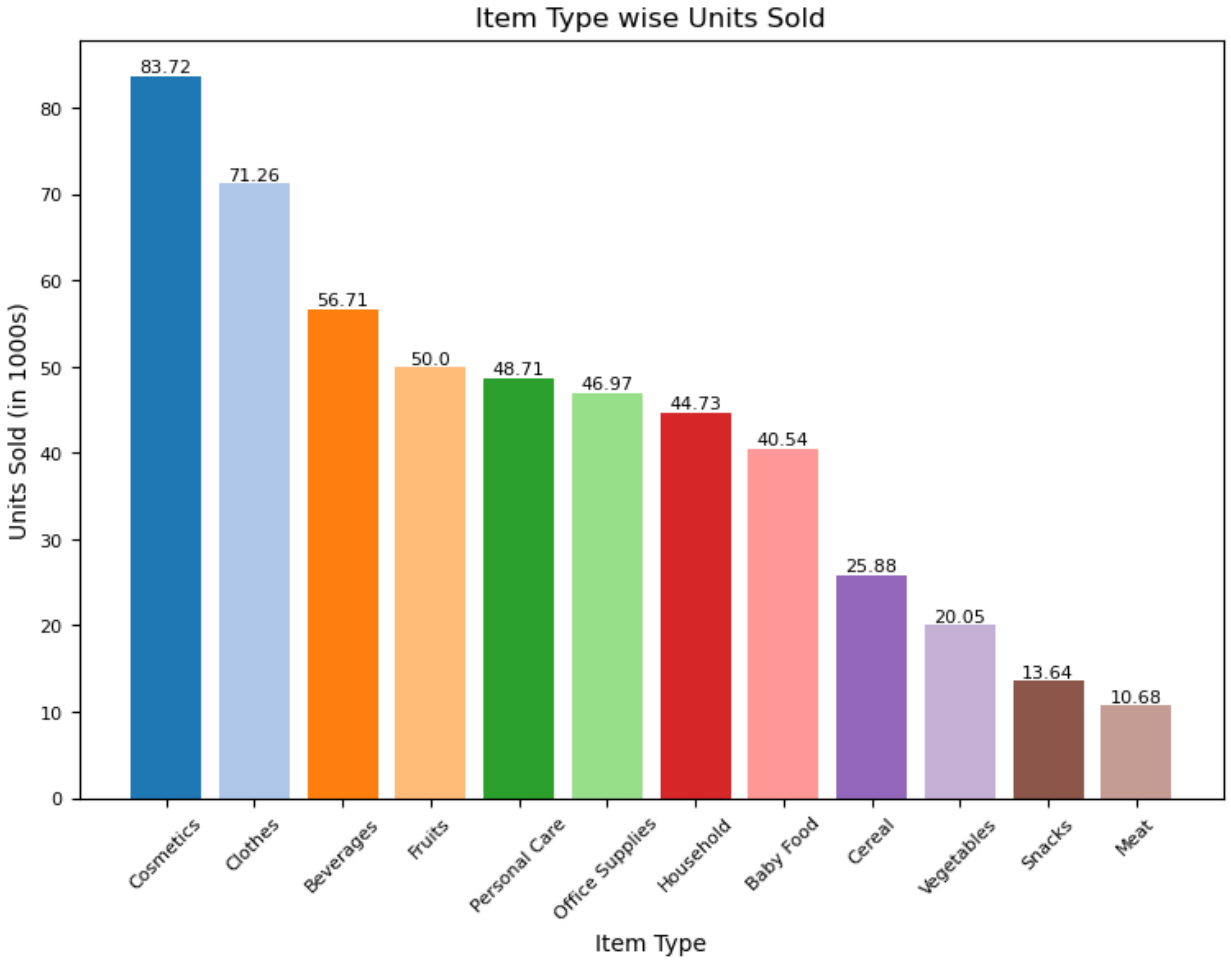
```
# Group by 'Item Type' and sum the 'Units Sold' column
Item_wise_Units = amz.groupby('Item Type')['Units Sold'].sum()

# Reset the index to make 'Item Type' a column
Item_wise_Units = Item_wise_Units.reset_index()

# Convert 'Units Sold' to thousands
Item_wise_Units['Units Sold'] = Item_wise_Units['Units Sold'] / 1000

# Round 'Units Sold' to two decimal places
Item_wise_Units['Units Sold'] = round(Item_wise_Units['Units Sold'],
2)

# Sort the DataFrame by 'Units Sold' in descending order
Item_wise_Units.sort_values(by='Units Sold', ascending=False,
inplace=True)

# Rename the 'Units Sold' column
Item_wise_Units.rename(columns={'Units Sold': 'Units Sold (in
1000s)'}, inplace=True)

# Print the resulting DataFrame
Item_wise_Units
```

	Item Type	Units Sold (in 1000s)
4	Cosmetics	83.72
3	Clothes	71.26
1	Beverages	56.71
5	Fruits	50.00
9	Personal Care	48.71
8	Office Supplies	46.97
6	Household	44.73
0	Baby Food	40.54
2	Cereal	25.88
11	Vegetables	20.05
10	Snacks	13.64
7	Meat	10.68

VISUALIZING ITEM TYPE WISE UNITS SOLD

```
# Create a bar plot for item-wise units sold
plt.figure(figsize=(9, 6))
item_units_barplot = plt.bar(Item_wise_Units['Item Type'],
Item_wise_Units['Units Sold (in 1000s)'], color=plt.cm.tab20.colors)

# Add data labels to the bars
plt.bar_label(item_units_barplot, labels=Item_wise_Units['Units Sold
(in 1000s)'], label_type='edge', color="black", fontsize=8)
```

```
# Set the x-axis and y-axis labels
plt.xlabel('Item Type')
plt.ylabel('Units Sold (in 1000s)')

# Set the title of the plot
plt.title('Item Type wise Units Sold')

# Rotate x-axis labels for better readability
plt.xticks(rotation=45, size=8)
plt.yticks(fontsize=8)

# Display the plot
plt.show()
```



ITEM TYPE WISE SALES

```
# Group by 'Item Type' and sum the 'Total Revenue' column
Item_wise_Sales = amz.groupby('Item Type')['Total Revenue'].sum()

# Convert the resulting Series to a DataFrame and reset the index
```

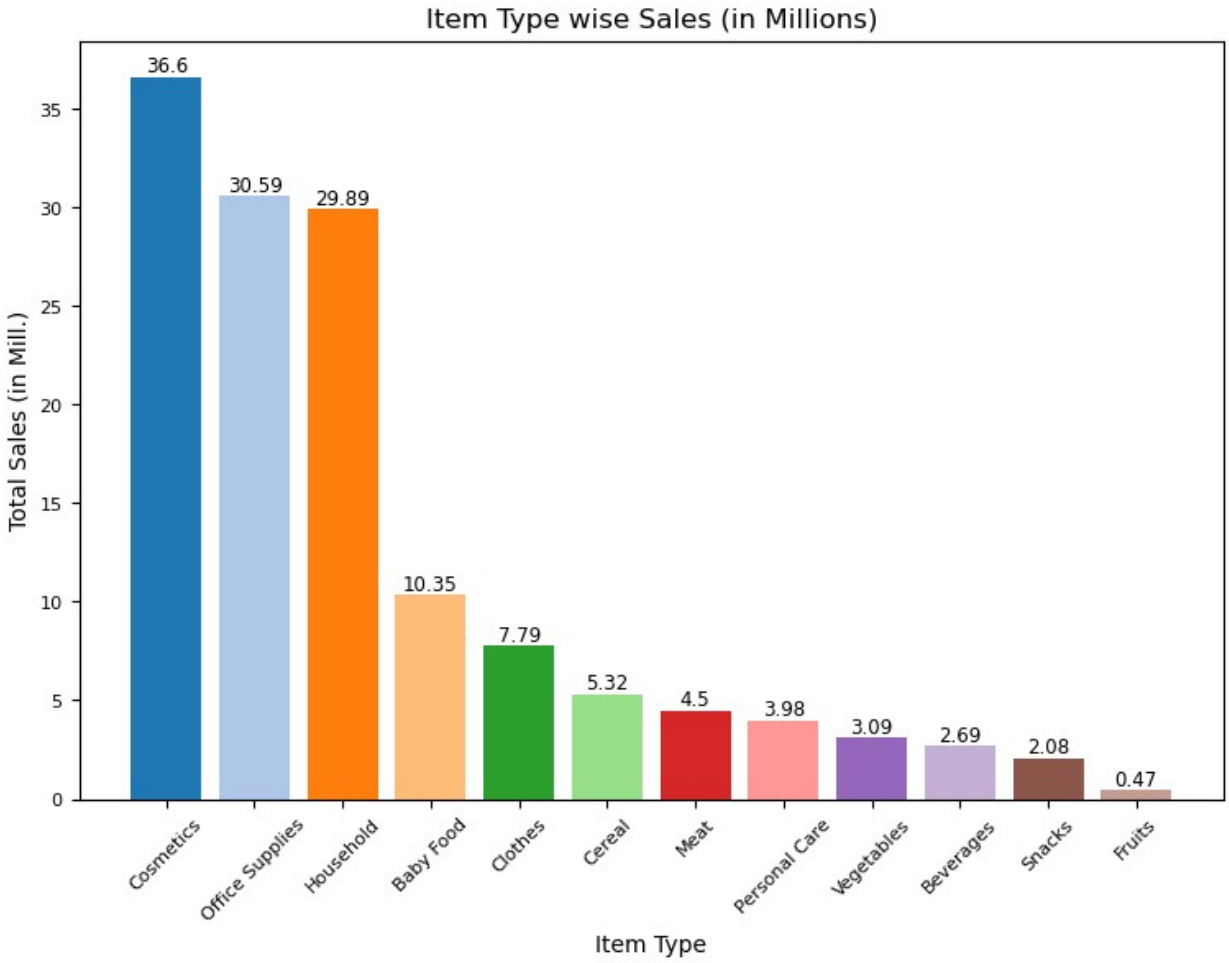
```
Item_wise_Sales = Item_wise_Sales.reset_index()

# Convert 'Total Revenue' to million dollars and round off to two
decimal places
Item_wise_Sales['Total Revenue'] = Item_wise_Sales['Total
Revenue'].apply(lambda x: x/1000000).round(2)

# Sort the DataFrame by 'Total Revenue' in descending order
Item_wise_Sales.sort_values(by='Total Revenue', ascending=False,
inplace=True)

# Rename the 'Total Revenue' column to 'Total Sales (in Mill.)'
Item_wise_Sales.rename(columns={'Total Revenue': 'Total Sales (in
Mill.)'}, inplace=True)

# Print the resulting DataFrame
Item_wise_Sales
```

	Item Type	Total Sales (in Mill.)
4	Cosmetics	36.60
8	Office Supplies	30.59
6	Household	29.89
0	Baby Food	10.35
3	Clothes	7.79
2	Cereal	5.32
7	Meat	4.50
9	Personal Care	3.98
11	Vegetables	3.09
1	Beverages	2.69
10	Snacks	2.08
5	Fruits	0.47

VISUALIZING ITEM TYPE WISE SALES

```
# Create a figure with specified size
plt.figure(figsize=(9, 6))

# Create a bar plot for item-wise sales
item_units_barplot = plt.bar(Item_wise_Sales['Item Type'],
Item_wise_Sales['Total Sales (in Mill.)'], color=plt.cm.tab20.colors)

# Add data labels to the bars
plt.bar_label(item_units_barplot, labels=Item_wise_Sales['Total Sales
(in Mill.)'], label_type='edge', color="black", fontsize=8.5)

# Set labels and title for the plot
plt.xlabel('Item Type')
plt.ylabel('Total Sales (in Mill.)')
plt.title('Item Type wise Sales (in Millions)')
```

```
# Rotate x-axis labels for better readability
plt.xticks(rotation=45, size=8)
plt.yticks(fontsize=8)

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



ITEM TYPE WISE PROFIT

```
# Group by 'Item Type' and sum the 'Total Profit' column
Item_wise_Profit = amz.groupby('Item Type')['Total Profit'].sum()

# Reset the index to make 'Item Type' a column
Item_wise_Profit = Item_wise_Profit.reset_index()

# Convert 'Total Profit' to million dollars and round off to two
decimal places
Item_wise_Profit['Total Profit'] = Item_wise_Profit['Total
Profit'].apply(lambda x: x / 1000000).round(2)
```

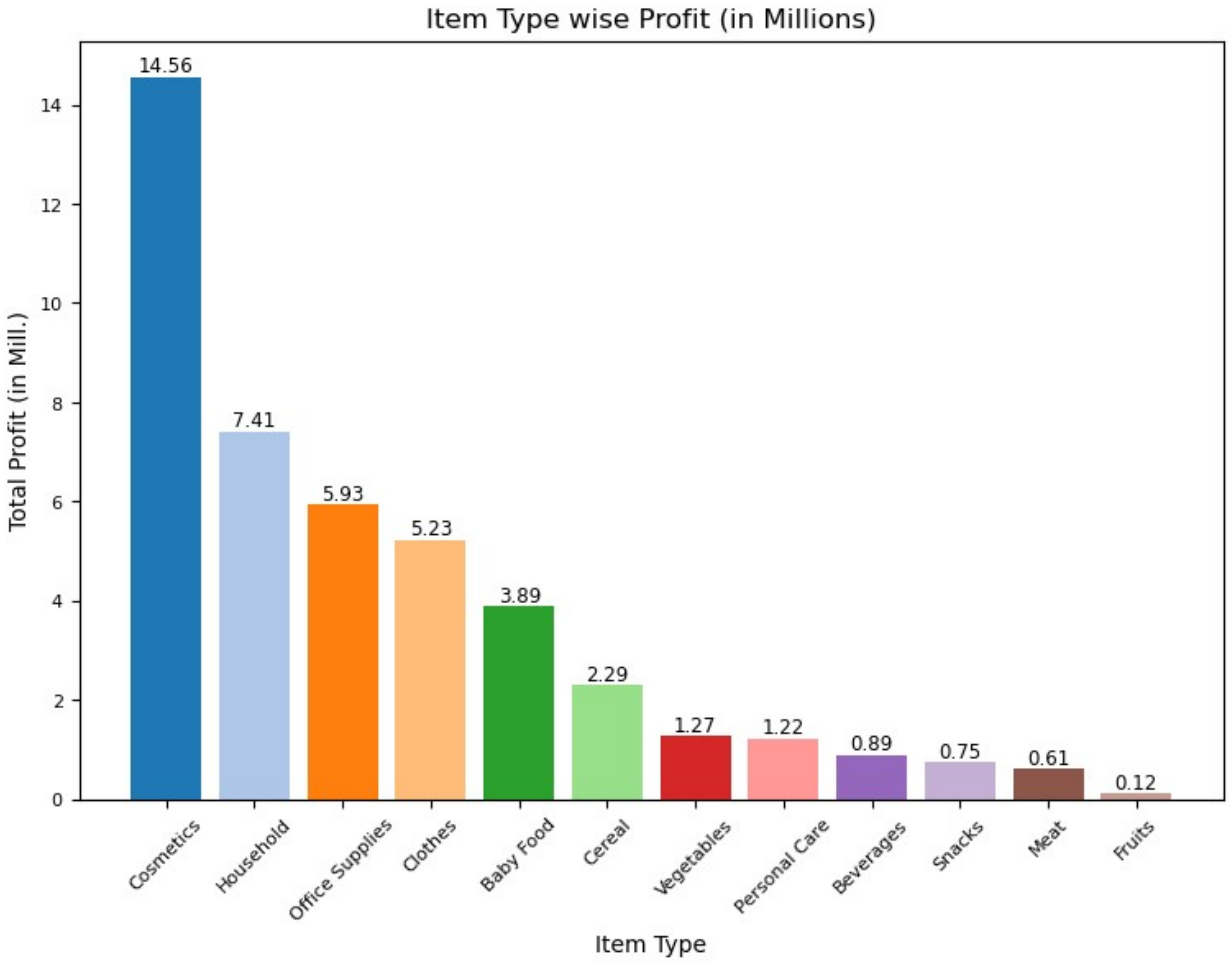
```
# Sort the DataFrame by 'Total Profit' in descending order
Item_wise_Profit.sort_values(by='Total Profit', ascending=False,
inplace=True)

# Rename the 'Total Profit' column
Item_wise_Profit.rename(columns={'Total Profit': 'Total Profit (in
Mill.)'}, inplace=True)

# Print the resulting DataFrame
Item_wise_Profit
```

	Item Type	Total Profit (in Mill.)
4	Cosmetics	14.56
6	Household	7.41
8	Office Supplies	5.93
3	Clothes	5.23
0	Baby Food	3.89
2	Cereal	2.29
11	Vegetables	1.27
9	Personal Care	1.22
1	Beverages	0.89
10	Snacks	0.75
7	Meat	0.61
5	Fruits	0.12

VISUALIZING ITEM TYPE WISE PROFIT

```
# Plotting a bar chart for item-wise profit

# Importing required libraries
import matplotlib.pyplot as plt

# Creating the figure and setting its size
plt.figure(figsize=(9, 6))

# Creating the bar plot
item_units_barplot = plt.bar(Item_wise_Profit['Item Type'],
Item_wise_Profit['Total Profit (in Mill.)'],
color=plt.cm.tab20.colors)

# Adding data labels to the bars
plt.bar_label(item_units_barplot, labels=Item_wise_Profit['Total
Profit (in Mill.)'], label_type='edge', color="black", fontsize=8.5)


# Adding labels and title to the plot
plt.xlabel('Item Type')
plt.ylabel('Total Profit (in Mill.)')
plt.title('Item Type wise Profit (in Millions)')
```

```
# Rotating x-axis labels for better readability
plt.xticks(rotation=45, size=8)
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



ITEM TYPE WISE SALES & PROFIT

```
# Grouping by 'Item Type' and summing the 'Total Revenue' and 'Total
Profit' columns
Item_wise_Sales = amz.groupby('Item Type')[['Total Revenue', 'Total
Profit']].sum()

# Resetting the index to make 'Item Type' a column
Item_wise_Sales = Item_wise_Sales.reset_index()

# Converting 'Total Revenue' and 'Total Profit' to million dollars and
rounding off to two decimal places
Item_wise_Sales['Total Revenue'] = Item_wise_Sales['Total
```

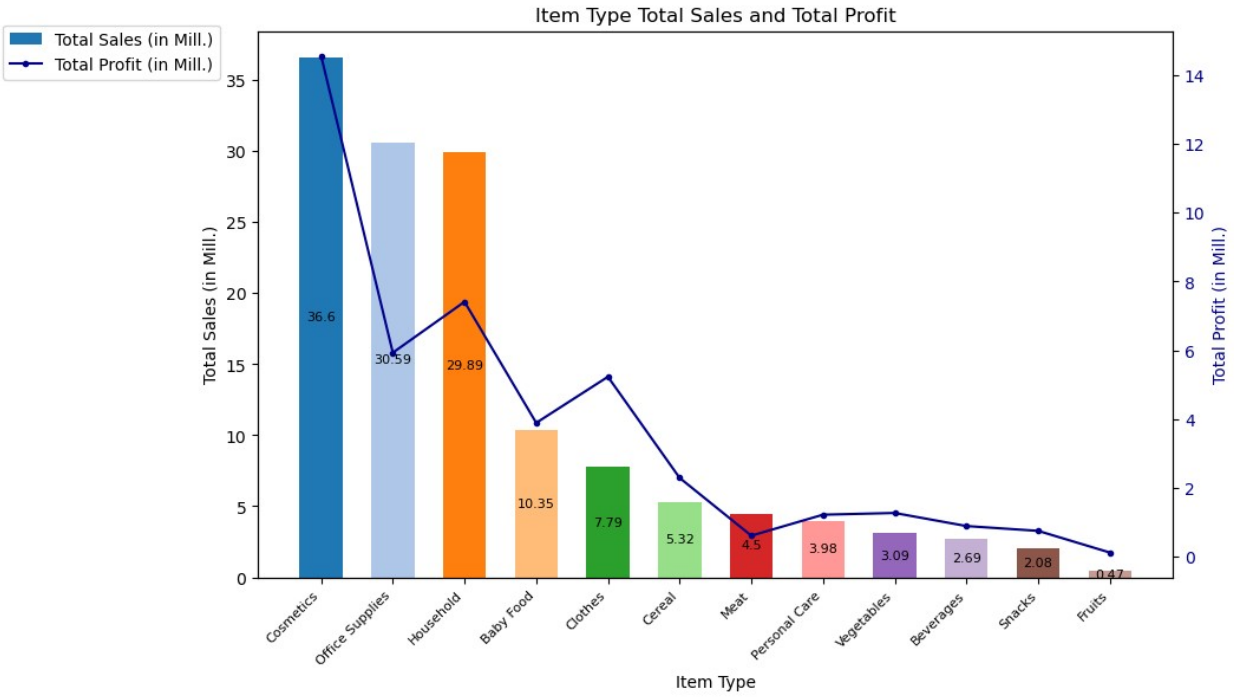
```
Revenue'].apply(lambda x: x / 1000000).round(2)
Item_wise_Sales['Total Profit'] = Item_wise_Sales['Total
Profit'].apply(lambda x: x / 1000000).round(2)

# Sorting by 'Total Revenue' in descending order
Item_wise_Sales.sort_values(by='Total Revenue', ascending=False,
inplace=True)

# Renaming the columns
Item_wise_Sales.rename(columns={'Total Revenue': 'Total Sales (in
Mill.)', 'Total Profit': 'Total Profit (in Mill.)'}, inplace=True)

# Printing the resulting DataFrame
Item_wise_Sales
```

	Item Type	Total Sales (in Mill.)	Total Profit (in Mill.)
4	Cosmetics	36.60	14.56
8	Office Supplies	30.59	5.93
6	Household	29.89	7.41
0	Baby Food	10.35	3.89
3	Clothes	7.79	5.23
2	Cereal	5.32	2.29
7	Meat	4.50	0.61
9	Personal Care	3.98	1.22
11	Vegetables	3.09	1.27
1	Beverages	2.69	0.89
10	Snacks	2.08	0.75
5	Fruits	0.47	0.12

VISUALIZING ITEM TYPE WISE SALES & PROFIT

```
import matplotlib.pyplot as plt

# Create figure and primary axis
fig, ax1 = plt.subplots(figsize=(10, 6))

# Bar plot for total sales
bar_width = 0.6
bar_positions = range(len(Item_wise_Sales['Item Type']))
bars = ax1.bar(bar_positions, Item_wise_Sales['Total Sales (in
Mill.)'], width=bar_width, color=plt.cm.tab20.colors, label='Total
Sales (in Mill.)')

# Add labels to the bars
ax1.bar_label(bars, labels=Item_wise_Sales['Total Sales (in Mill.)'],
label_type='center', color='black', fontsize=8)

# Set x-axis labels
ax1.set_xlabel('Item Type')
ax1.set_ylabel('Total Sales (in Mill.)')
```

```
ax1.set_title('Item Type Total Sales and Total Profit')
ax1.set_xticks(bar_positions)
ax1.set_xticklabels(Item_wise_Sales['Item Type'], rotation=45,
ha='right', fontsize=8)

# Create secondary axis
ax2 = ax1.twinx()

# Line plot for total profit
line_plot = ax2.plot(bar_positions, Item_wise_Sales['Total Profit (in
Mill.)'], color='darkblue', marker='.', linestyle='-', linewidth=1.5,
label='Total Profit (in Mill.)')
ax2.set_ylabel('Total Profit (in Mill.)', color='darkblue')
ax2.tick_params(axis='y', labelcolor='darkblue')

# Add a legend to indicate what the bars and lines represent
fig.legend(loc='upper right', bbox_to_anchor=(0.1, 0.9))

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



SALES CHANNEL WISE PROFIT

```
# Calculating total profit by sales channel

# Grouping by sales channel and summing the total profit
Channel_wise_Profit = amz.groupby('Sales Channel')['Total
Profit'].sum()
```

```
# Resetting the index to convert the resulting series to a DataFrame
Channel_wise_Profit = Channel_wise_Profit.reset_index()

# Converting total profit to million dollars and formatting it as a
string
Channel_wise_Profit['Total Profit'] = Channel_wise_Profit['Total
Profit'].apply(lambda x : f"$ {x/1000000:.2f} M")

# Sorting the DataFrame by total profit in descending order
Channel_wise_Profit.sort_values(by='Total Profit', ascending=False,
inplace=True)

# Displaying the DataFrame
Channel_wise_Profit
```

	Sales Channel	Total Profit
0	Offline	$ 24.92 M
1	Online	$ 19.25 M

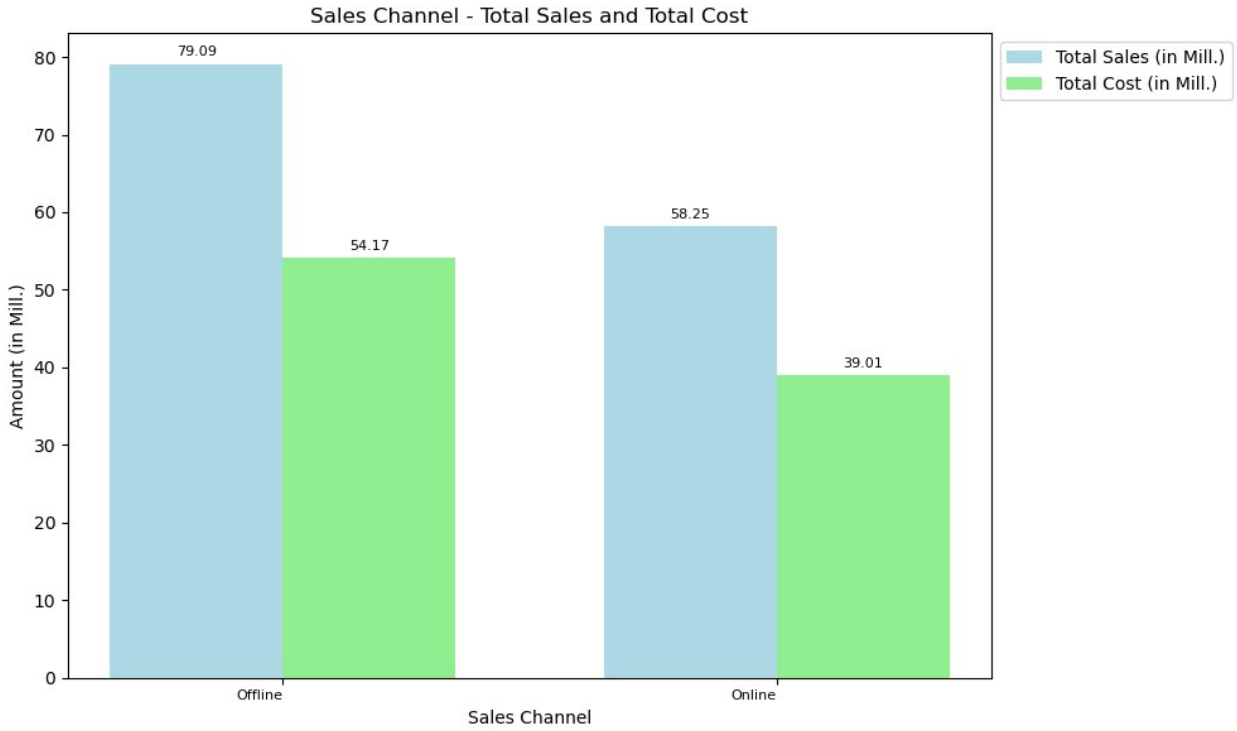
SALES CHANNEL WISE SALES & COST

```
# Calculating total sales and cost by sales channel

# Grouping by sales channel and summing the total revenue and total
cost
Channel_wise_Sales_Cost = amz.groupby('Sales Channel')[['Total
Revenue','Total Cost']].sum()

# Converting total revenue and total cost to million dollars and
rounding to two decimal places
Channel_wise_Sales_Cost['Total Revenue'] =
Channel_wise_Sales_Cost['Total Revenue'].apply(lambda x :
x/1000000).round(2)
Channel_wise_Sales_Cost['Total Cost'] = Channel_wise_Sales_Cost['Total
Cost'].apply(lambda x : x/1000000).round(2)

# Renaming columns for clarity
Channel_wise_Sales_Cost.rename(columns={'Total Revenue': 'Total Sales
(in Mill.)', 'Total Cost': 'Total Cost (in Mill.)'}, inplace=True)

# Displaying the DataFrame
Channel_wise_Sales_Cost
```

Sales Channel	Total Sales (in Mill.)	Total Cost (in Mill.)
Offline	79.09	54.17
Online	58.25	39.01

VISUALIZING SALES CHANNEL WISE SALES & COST

```
# Set up the figure and axis
fig, ax = plt.subplots(figsize=(10, 6))

# Define the bar width and the positions of the bars
bar_width = 0.35
bar_positions = np.arange(len(Channel_wise_Sales_Cost))

# Plot the bars for Total Sales and Total Cost
bars1 = ax.bar(bar_positions, Channel_wise_Sales_Cost['Total Sales (in
Mill.)'], width=bar_width, color='lightblue', label='Total Sales (in
Mill.)')
bars2 = ax.bar(bar_positions + bar_width,
Channel_wise_Sales_Cost['Total Cost (in Mill.)'], width=bar_width,
color='lightgreen', label='Total Cost (in Mill.)')

# Add labels to the bars
ax.bar_label(bars1, labels=Channel_wise_Sales_Cost['Total Sales (in
Mill.)'], padding=3, fontsize=8, color='black')
ax.bar_label(bars2, labels=Channel_wise_Sales_Cost['Total Cost (in
Mill.)'], padding=3, fontsize=8, color='black')

# Set the x-axis labels and ticks
ax.set_xlabel('Sales Channel')
ax.set_ylabel('Amount (in Mill.)')
ax.set_title('Sales Channel - Total Sales and Total Cost')
ax.set_xticks(bar_positions + bar_width / 2)
ax.set_xticklabels(Channel_wise_Sales_Cost.index, ha='right',
fontsize=8)

# Add a legend
ax.legend(loc='upper left', bbox_to_anchor=(1.0, 1.0))

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



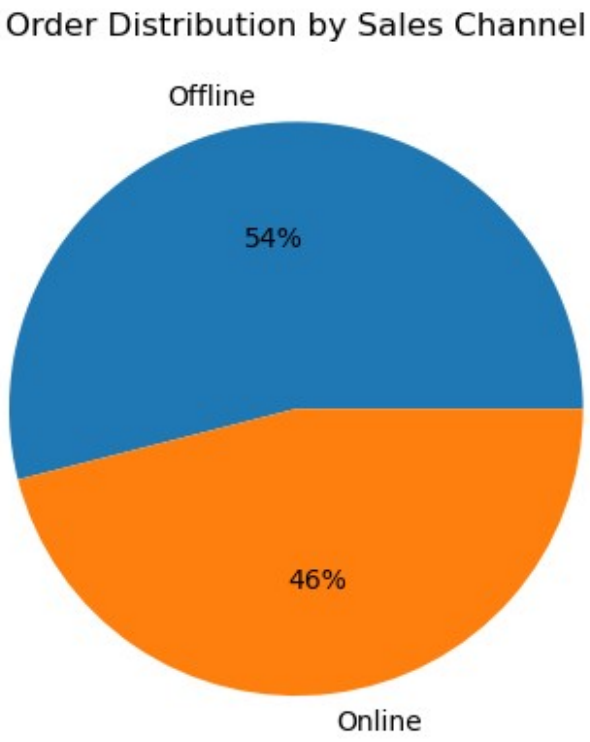
SALES CHANNEL WISE UNITS SOLD

```
# Grouping the data by 'Sales Channel' and summing up the 'Units Sold' for each channel
Channel_wise_Units = amz.groupby('Sales Channel')['Units Sold'].sum()

# Resetting the index to convert the GroupBy object to a DataFrame and make 'Sales Channel' a column again
Channel_wise_Units = Channel_wise_Units.reset_index()

# Converting the 'Units Sold' values from units to thousands and rounding to two decimal places
Channel_wise_Units['Units Sold'] = Channel_wise_Units['Units Sold'].apply(lambda x : x/1000).round(2)

# Sorting the DataFrame by 'Units Sold' in descending order
Channel_wise_Units.sort_values(by = ['Units Sold'], ascending = False, inplace = True)

# Renaming the 'Units Sold' column to 'Units Sold (in 1000s)' for clarity
Channel_wise_Units.rename(columns = {'Units Sold' : 'Units Sold (in 1000s)'}, inplace = True)

# Displaying the modified DataFrame
Channel_wise_Units
```

```
  Sales Channel  Units Sold (in 1000s)
0       Offline                 276.78
1        Online                 236.09
```

VISUALIZING SALES CHANNEL WISE UNITS SOLD

```
#plt.figure(figsize=(8, 8))
channel_pieplot = plt.pie(Channel_wise_Units['Units Sold (in 1000s)'],
labels = Channel_wise_Units['Sales Channel'],autopct='%1.f%%',
colors=plt.cm.tab10.colors)

# Add title and labels
plt.title('Order Distribution by Sales Channel')
plt.show()
```



REGION WISE TOTAL PROFIT

```
# Grouping the data by 'Region' and summing up the 'Total Profit' for
each region
Region_wise_Profit = amz.groupby('Region')['Total Profit'].sum()

# Resetting the index to convert the GroupBy object to a DataFrame and
make 'Region' a column again
Region_wise_Profit = Region_wise_Profit.reset_index()

# Sorting the DataFrame by 'Total Profit' in descending order
```

```
Region_wise_Profit.sort_values(by = 'Total Profit', ascending = False,
inplace = True)

# Formatting the 'Total Profit' column to display values in millions
with a dollar sign and two decimal places
Region_wise_Profit['Total Profit'] = Region_wise_Profit['Total
Profit'].apply(lambda x : f" $ {x/1000000:.2f} M")

# Displaying the modified DataFrame
Region_wise_Profit
```

	Region	Total Profit
6	Sub-Saharan Africa	$ 12.18 M
3	Europe	$ 11.08 M
0	Asia	$ 6.11 M
4	Middle East and North Africa	$ 5.76 M
1	Australia and Oceania	$ 4.72 M
2	Central America and the Caribbean	$ 2.85 M
5	North America	$ 1.46 M

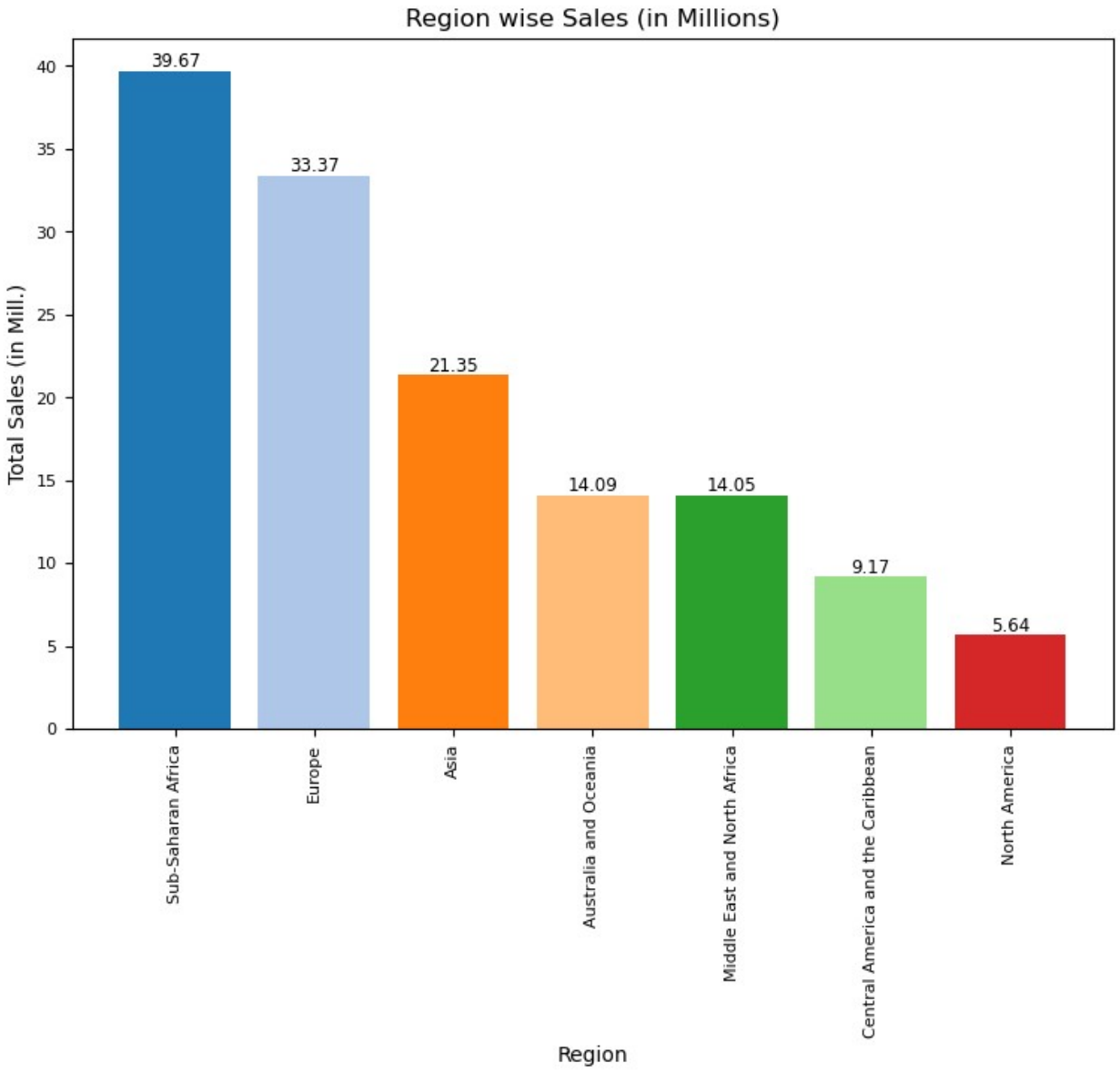
REGION WISE SALES

```
# Group by 'Region' and calculate the sum of 'Total Revenue'
Region_wise_Sales = amz.groupby('Region')['Total Revenue'].sum()

# Reset the index to flatten the DataFrame
Region_wise_Sales = Region_wise_Sales.reset_index()

# Sort the values numerically before formatting
Region_wise_Sales.sort_values(by = 'Total Revenue', ascending = False,
inplace = True)

# Format 'Total Revenue' to display in millions with a dollar sign
Region_wise_Sales['Total Revenue'] = Region_wise_Sales['Total
Revenue'].apply(lambda x: x / 1000000).round(2)

Region_wise_Sales.rename(columns = {'Total Revenue' : 'Total Sales (in
Mill.)'}, inplace = True)

# Display the resulting DataFrame
Region_wise_Sales
```

	Region	Total Sales (in Mill.)
6	Sub-Saharan Africa	39.67
3	Europe	33.37
0	Asia	21.35
1	Australia and Oceania	14.09
4	Middle East and North Africa	14.05
2	Central America and the Caribbean	9.17
5	North America	5.64

VISUALIZING REGION WISE SALES

```
# Setting the figure size to 9 inches by 6 inches
plt.figure(figsize=(9, 6))

# Creating a bar plot for total sales by region with specified colors
item_units_barplot = plt.bar(Region_wise_Sales['Region'],
Region_wise_Sales['Total Sales (in Mill.)'], color =
plt.cm.tab20.colors)

# Adding labels to the bars with the total sales values, positioning
the labels at the edge of the bars
plt.bar_label(item_units_barplot, labels = Region_wise_Sales['Total
Sales (in Mill.)'], label_type='edge', color="black", fontsize=8.5)

# Setting the label for the x-axis as 'Region'
plt.xlabel('Region')

# Setting the label for the y-axis as 'Total Sales (in Mill.)'
plt.ylabel('Total Sales (in Mill.)')

# Setting the title of the plot as 'Region wise Sales (in Millions)'
plt.title('Region wise Sales (in Millions)')

# Rotating the x-axis labels by 90 degrees for better readability and
setting the font size to 8
plt.xticks(rotation=90, size=8)

# Setting the font size of the y-axis ticks to 8
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



REGION WISE SALES, PROFIT & PROFIT MARGIN

```
# Group by 'Region' and calculate the sum of 'Total Revenue'
Region_wise_Sales_Profit = amz.groupby('Region')[['Total
Revenue','Total Profit']].sum()

# Reset the index to flatten the DataFrame
Region_wise_Sales_Profit = Region_wise_Sales_Profit.reset_index()

# Calculating Region wise Profit Marin
Region_wise_Sales_Profit['Profit Margin'] =
(Region_wise_Sales_Profit['Total
Revenue']/Region_wise_Sales_Profit['Total Profit']).round(2)
```

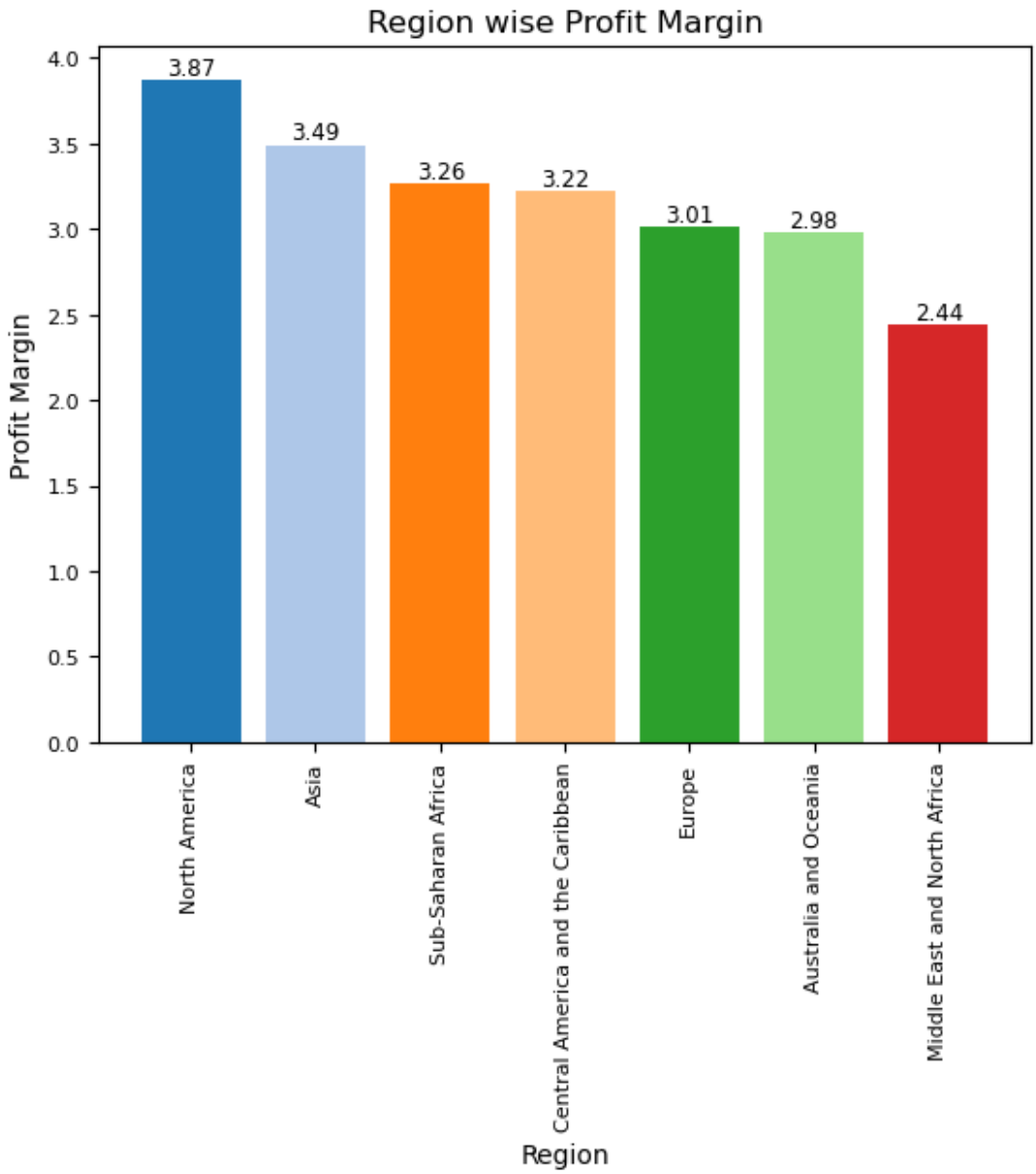
```
# Sort the values numerically before formatting
Region_wise_Sales_Profit.sort_values(by = 'Profit Margin', ascending =
False, inplace = True)

# Format 'Total Revenue' to display in millions with a dollar sign
Region_wise_Sales_Profit['Total Revenue'] =
Region_wise_Sales_Profit['Total Revenue'].apply(lambda x: f"$ {x /
1000000:.2f} M")

# Format 'Total Profit' to display in millions with a dollar sign
Region_wise_Sales_Profit['Total Profit'] =
Region_wise_Sales_Profit['Total Profit'].apply(lambda x: f"$ {x /
1000000:.2f} M")


# Display the resulting DataFrame
Region_wise_Sales_Profit
```

```
                              Region Total Revenue Total Profit
Profit Margin
5                      North America      $ 5.64 M     $ 1.46 M
3.87
0                               Asia     $ 21.35 M     $ 6.11 M
3.49
6                  Sub-Saharan Africa     $ 39.67 M    $ 12.18 M
3.26
2  Central America and the Caribbean      $ 9.17 M     $ 2.85 M
3.22
3                              Europe     $ 33.37 M    $ 11.08 M
3.01
1               Australia and Oceania     $ 14.09 M     $ 4.72 M
2.98
4       Middle East and North Africa     $ 14.05 M     $ 5.76 M
2.44
```

VISUALIZING REGION WISE PROFIT MARGIN

```
# Creating a bar plot for profit margin of top 10 countries

#plt.figure(figsize=(9, 6))

Region_wise_Profit_margin = Region_wise_Sales_Profit[['Region',
'Profit Margin']]

# Creating the bar plot
Region_profit_bar = plt.bar(Region_wise_Sales_Profit['Region'],
Region_wise_Sales_Profit['Profit Margin'], color=plt.cm.tab20.colors)

# Adding data labels to the bars
plt.bar_label(Region_profit_bar,
```

```
labels=Region_wise_Sales_Profit['Profit Margin'], label_type='edge',
color="black", fontsize=8.5)

# Adding labels and title to the plot
plt.xlabel('Region')
plt.ylabel('Profit Margin')
plt.title('Region wise Profit Margin')

# Rotating x-axis labels for better readability
plt.xticks(rotation=90, size=8)
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



CREATING A COLUMN DELIVERY TIME

```
# Calculating delivery time

# Subtracting the 'Order Date' from the 'Ship Date' to calculate
delivery time
amz['Delivery_time'] = amz['Ship Date'] - amz['Order Date']

# Displaying the DataFrame with the new 'Delivery_time' column
amz
```

```
                                                Country         Item
Type  \
```

```
Region

Australia and Oceania                                Tuvalu        Baby
Food
Central America and the Caribbean                   Grenada
Cereal
Europe                                               Russia  Office
Supplies
Sub-Saharan Africa                  Sao Tome and Principe
Fruits
Sub-Saharan Africa                                   Rwanda  Office
Supplies
...                                                     ...
...
Sub-Saharan Africa                                     Mali
Clothes
Asia                                                Malaysia
Fruits
Sub-Saharan Africa                               Sierra Leone
Vegetables
North America                                        Mexico    Personal
Care
Sub-Saharan Africa                                Mozambique
Household

                                  Sales Channel Order Priority Order
Date  \
Region

Australia and Oceania                      Offline              H 2010-
05-28
Central America and the Caribbean           Online              C 2012-
08-22
Europe                                     Offline              L 2014-
05-02
Sub-Saharan Africa                          Online              C 2014-
06-20
Sub-Saharan Africa                         Offline              L 2013-
02-01
...                                           ...             ...
...
Sub-Saharan Africa                          Online              M 2011-
07-26
Asia                                       Offline              L 2011-
11-11
Sub-Saharan Africa                         Offline              C 2016-
06-01
North America                              Offline              M 2015-
07-30
Sub-Saharan Africa                         Offline              L 2012-
```

```
02-10

                                  Order ID  Ship Date  Units Sold  \
Region
Australia and Oceania             669165933 2010-06-27        9925
Central America and the Caribbean  963881480 2012-09-15        2804
Europe                            341417157 2014-05-08        1779
Sub-Saharan Africa                514321792 2014-07-05        8102
Sub-Saharan Africa                115456712 2013-02-06        5062
...                                     ...        ...         ...
Sub-Saharan Africa                512878119 2011-09-03         888
Asia                              810711038 2011-12-28        6267
Sub-Saharan Africa                728815257 2016-06-29        1485
North America                     559427106 2015-08-08        5767
Sub-Saharan Africa                665095412 2012-02-15        5367

                                  Unit Price  Unit Cost  Total
Revenue  \
Region

Australia and Oceania                 255.28     159.42
2533654.00
Central America and the Caribbean     205.70     117.11
576782.80
Europe                                651.21     524.96
1158502.59
Sub-Saharan Africa                      9.33       6.92
75591.66
Sub-Saharan Africa                    651.21     524.96
3296425.02
...                                      ...        ...             ..
.
Sub-Saharan Africa                    109.28      35.84
97040.64
Asia                                    9.33       6.92
58471.11
Sub-Saharan Africa                    154.06      90.93
228779.10
North America                          81.73      56.67
471336.91
Sub-Saharan Africa                    668.27     502.54
3586605.09

                                  Total Cost  Total Profit
Delivery_time
Region

Australia and Oceania             1582243.50     951410.50       30
days
Central America and the Caribbean   328376.44     248406.36       24
```

```
days
Europe                                933903.84     224598.75         6
days
Sub-Saharan Africa                     56065.84      19525.82        15
days
Sub-Saharan Africa                   2657347.52     639077.50         5
days
...                                         ...           ...
...
Sub-Saharan Africa                     31825.92      65214.72        39
days
Asia                                   43367.64      15103.47        47
days
Sub-Saharan Africa                    135031.05      93748.05        28
days
North America                          326815.89     144521.02         9
days
Sub-Saharan Africa                   2697132.18     889472.91         5
days

[100 rows x 14 columns]
```

REGION WISE AVERAGE DELIVERY TIME

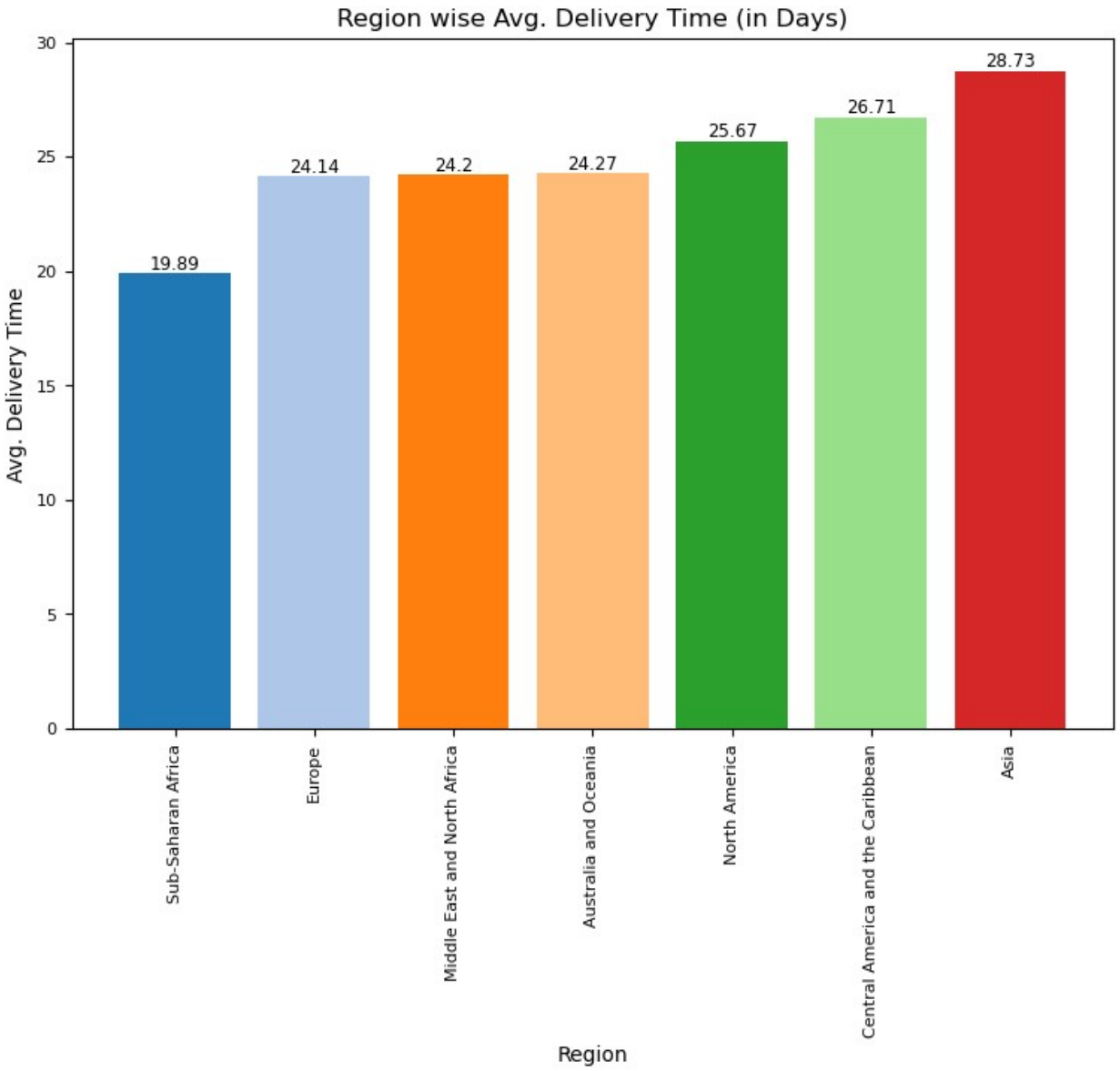
```
# Calculating average delivery time per region

# Grouping by 'Region' and calculating the mean of 'Delivery_time'
Avg_Delivery_time = amz.groupby('Region')['Delivery_time'].mean()

# Resetting the index to make 'Region' a column
Avg_Delivery_time = Avg_Delivery_time.reset_index()

# Sorting the DataFrame by 'Delivery_time'
Avg_Delivery_time.sort_values(by='Delivery_time', inplace=True)

# Converting delivery time from timedelta to days and rounding off to
two decimal places
Avg_Delivery_time['Delivery_time'] =
Avg_Delivery_time['Delivery_time'].apply(lambda x: x.total_seconds() /
86400).round(2)

# Renaming the 'Delivery_time' column to 'Avg_Del_time (in Days)'
Avg_Delivery_time.rename(columns={'Delivery_time': 'Avg_Del_time (in
Days)'}, inplace=True)

# Displaying the resulting DataFrame
Avg_Delivery_time
```

```
                          Region  Avg_Del_time (in Days)
6                Sub-Saharan Africa                  19.89
```

```
3                              Europe                    24.14
4       Middle East and North Africa                     24.20
1              Australia and Oceania                     24.27
5                      North America                     25.67
2  Central America and the Caribbean                     26.71
0                               Asia                     28.73
```

VISUALIZING REGION WISE AVERAGE DELIVERY TIME

```
# Creating a bar plot for average delivery time per region

plt.figure(figsize=(9, 6))

# Creating the bar plot
item_units_barplot = plt.bar(Avg_Delivery_time['Region'],
Avg_Delivery_time['Avg_Del_time (in Days)'],
color=plt.cm.tab20.colors)

# Adding data labels to the bars
plt.bar_label(item_units_barplot,
labels=Avg_Delivery_time['Avg_Del_time (in Days)'], label_type='edge',
color="black", fontsize=8.5)

# Adding labels and title to the plot
plt.xlabel('Region')
plt.ylabel('Avg. Delivery Time')
plt.title('Region wise Avg. Delivery Time (in Days)')

# Rotating x-axis labels for better readability
plt.xticks(rotation=90, size=8)
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



COUNTRY WISE SALES, PROFIT & PROFIT MARGIN

```
# Group by 'Region' and calculate the sum of 'Total Revenue'
Country_wise_Sales_Profit = amz.groupby('Country')[['Total
Revenue','Total Profit']].sum()

# Reset the index to flatten the DataFrame
Country_wise_Sales_Profit = Country_wise_Sales_Profit.reset_index()

# Calculating Region wise Profit Marin
Country_wise_Sales_Profit['Profit Margin'] =
(Country_wise_Sales_Profit['Total
Revenue']/Country_wise_Sales_Profit['Total Profit']).round(2)
```

```
# Sort the values numerically before formatting
Country_wise_Sales_Profit.sort_values(by = 'Profit Margin', ascending
= False, inplace = True)

# Format 'Total Revenue' to display in millions with a dollar sign
Country_wise_Sales_Profit['Total Revenue'] =
Country_wise_Sales_Profit['Total Revenue'].apply(lambda x: f"$ {x /
1000000:.2f} M")

# Format 'Total Profit' to display in millions with a dollar sign
Country_wise_Sales_Profit['Total Profit'] =
Country_wise_Sales_Profit['Total Profit'].apply(lambda x: f"$ {x /
1000000:.2f} M")

# Display the resulting DataFrame
Country_wise_Sales_Profit.head(10)
```

	Country	Total Revenue	Total Profit	Profit Margin
17	East Timor	$ 2.49 M	$ 0.34 M	7.38
40	Mauritania	$ 0.82 M	$ 0.16 M	5.16
7	Brunei	$ 4.37 M	$ 0.85 M	5.16
55	Russia	$ 1.16 M	$ 0.22 M	5.16
35	Lithuania	$ 5.40 M	$ 1.05 M	5.16
10	Cameroon	$ 3.85 M	$ 0.78 M	4.93
62	Sierra Leone	$ 3.10 M	$ 0.65 M	4.77
72	Turkmenistan	$ 5.82 M	$ 1.27 M	4.59
8	Bulgaria	$ 2.78 M	$ 0.63 M	4.44
2	Australia	$ 2.49 M	$ 0.58 M	4.32

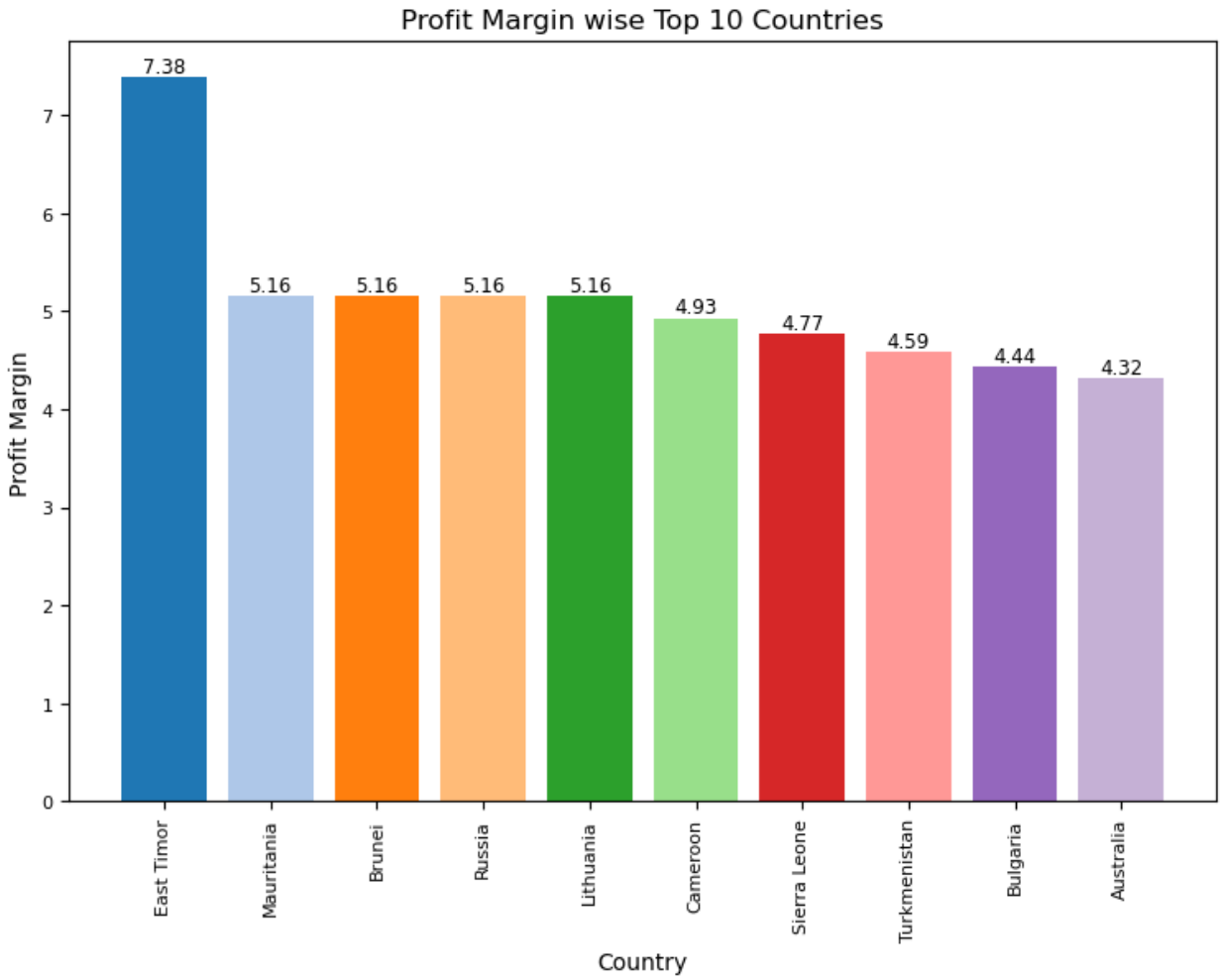
PROFIT MARGIN WISE TOP 10 COUNTRIES

```
# Creating a new DataFrame with only 'Country' and 'Profit Margin'
columns
country_profit_margin = Country_wise_Sales_Profit[['Country', 'Profit
Margin']].head(10)

# Display the new DataFrame
country_profit_margin
```

	Country	Profit Margin
17	East Timor	7.38
40	Mauritania	5.16
7	Brunei	5.16
55	Russia	5.16
35	Lithuania	5.16
10	Cameroon	4.93
62	Sierra Leone	4.77
72	Turkmenistan	4.59
8	Bulgaria	4.44
2	Australia	4.32

VISUALIZING PROFIT MARGIN WISE TOP 10 COUNTRIES

```
# Creating a bar plot for profit margin of top 10 countries

plt.figure(figsize=(9, 6))

# Creating the bar plot
country_profit_bar = plt.bar(country_profit_margin['Country'],
country_profit_margin['Profit Margin'], color=plt.cm.tab20.colors)

# Adding data labels to the bars
plt.bar_label(country_profit_bar, labels=country_profit_margin['Profit
Margin'], label_type='edge', color="black", fontsize=8.5)

# Adding labels and title to the plot
plt.xlabel('Country')
plt.ylabel('Profit Margin')
plt.title('Profit Margin wise Top 10 Countries')

# Rotating x-axis labels for better readability
plt.xticks(rotation=90, size=8)
plt.yticks(fontsize=8)

# Displaying the plot
plt.show()
```



PROFIT MARGIN WISE BOTTOM 10 COUNTRIES

```
# Creating a new DataFrame with only 'Country' and 'Profit Margin' columns
country_profit_margin = Country_wise_Sales_Profit[['Country', 'Profit Margin']].tail(10)

# Display the new DataFrame
country_profit_margin
```

	Country	Profit Margin
34	Libya	1.50
14	Cote d'Ivoire	1.49
11	Cape Verde	1.49
19	Fiji	1.49
37	Madagascar	1.49
32	Lebanon	1.49
6	Belize	1.49
5	Bangladesh	1.49

```
36      Macedonia            1.49
0         Albania            1.49
```