Required library

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

executed in 5.71s, finished 20:58:50 2024-06-26

Total sales by different groups

sales by retailer

sales by region

sales by products

sales by method

Total sales trend over years

In [2]:
```
Data = pd.read_excel('Adidas US Sales Datasets.xlsx')
```

executed in 6.05s, finished 20:58:56 2024-06-26

In [3]:
```
1 Data.head()
```
executed in 45ms, finished 20:58:56 2024-06-26

Out[3]:

	Retailer	Retailer ID	Invoice Date	Region	State	City	Product	Price per Unit	Units Sold	Total Sales	Operating Profit	Operating Margin	Sales Method
0	Foot Locker	1185732	2020-01-01	Northeast	New York	New York	Men's Street Footwear	50.0	1200	600000.0	300000.0	0.50	In-store
1	Foot Locker	1185732	2020-01-02	Northeast	New York	New York	Men's Athletic Footwear	50.0	1000	500000.0	150000.0	0.30	In-store
2	Foot Locker	1185732	2020-01-03	Northeast	New York	New York	Women's Street Footwear	40.0	1000	400000.0	140000.0	0.35	In-store
3	Foot Locker	1185732	2020-01-04	Northeast	New York	New York	Women's Athletic Footwear	45.0	850	382500.0	133875.0	0.35	In-store
4	Foot Locker	1185732	2020-01-05	Northeast	New York	New York	Men's Apparel	60.0	900	540000.0	162000.0	0.30	In-store

In [4]:
```
1 Data.tail()
```
executed in 30ms, finished 20:58:56 2024-06-26

Out[4]:

	Retailer	Retailer ID	Invoice Date	Region	State	City	Product	Price per Unit	Units Sold	Total Sales	Operating Profit	Operating Margin	Sales Method
9643	Foot Locker	1185732	2021-01-24	Northeast	New Hampshire	Manchester	Men's Apparel	50.0	64	3200.0	896.00	0.28	Outlet
9644	Foot Locker	1185732	2021-01-24	Northeast	New Hampshire	Manchester	Women's Apparel	41.0	105	4305.0	1377.60	0.32	Outlet
9645	Foot Locker	1185732	2021-02-22	Northeast	New Hampshire	Manchester	Men's Street Footwear	41.0	184	7544.0	2791.28	0.37	Outlet
9646	Foot Locker	1185732	2021-02-22	Northeast	New Hampshire	Manchester	Men's Athletic Footwear	42.0	70	2940.0	1234.80	0.42	Outlet
9647	Foot Locker	1185732	2021-02-22	Northeast	New Hampshire	Manchester	Women's Street Footwear	29.0	83	2407.0	649.89	0.27	Outlet

In [5]:
```
1 Data.sample(5)
```
executed in 36ms, finished 20:58:56 2024-06-26

Out[5]:

	Retailer	Retailer ID	Invoice Date	Region	State	City	Product	Price per Unit	Units Sold	Total Sales	Operating Profit	Operating Margin	Sal Metho
8315	Sports Direct	1197831	2021-04-18	South	Tennessee	Knoxville	Women's Athletic Footwear	32.0	196	6272.0	3825.92	0.61	Out
1137	Sports Direct	1197831	2021-10-01	South	Alabama	Birmingham	Men's Athletic Footwear	20.0	625	125000.0	62500.00	0.50	Out
7590	Sports Direct	1185732	2021-07-13	Northeast	Massachusetts	Boston	Women's Athletic Footwear	44.0	56	2464.0	887.04	0.36	Onli
946	Sports Direct	1197831	2021-03-24	South	Tennessee	Knoxville	Women's Street Footwear	30.0	475	142500.0	57000.00	0.40	Out
4784	Kohl's	1189833	2021-02-02	Midwest	Montana	Billings	Men's Street Footwear	37.0	203	7511.0	4431.49	0.59	Onli

In [6]:
```
1 Data.columns
```
executed in 14ms, finished 20:58:56 2024-06-26

Out[6]:
```
Index(['Retailer', 'Retailer ID', 'Invoice Date', 'Region', 'State', 'City',
       'Product', 'Price per Unit', 'Units Sold', 'Total Sales',
       'Operating Profit', 'Operating Margin', 'Sales Method'],
      dtype='object')
```

In [7]:
```
1 Data.shape
```
executed in 10ms, finished 20:58:56 2024-06-26

Out[7]:
```
(9648, 13)
```

In [8]:
```
1 Data.size
```
executed in 11ms, finished 20:58:56 2024-06-26

Out[8]:
```
125424
```

In [9]:
```
1 Data.info()
```
executed in 27ms, finished 20:58:56 2024-06-26

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9648 entries, 0 to 9647
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype         
---  ------            --------------  -----         
 0   Retailer          9648 non-null   object        
 1   Retailer ID       9648 non-null   int64         
 2   Invoice Date      9648 non-null   datetime64[ns]
 3   Region            9648 non-null   object        
 4   State             9648 non-null   object        
 5   City              9648 non-null   object        
 6   Product           9648 non-null   object        
 7   Price per Unit    9648 non-null   float64       
 8   Units Sold        9648 non-null   int64         
 9   Total Sales       9648 non-null   float64       
 10  Operating Profit  9648 non-null   float64       
 11  Operating Margin  9648 non-null   float64       
 12  Sales Method      9648 non-null   object        
dtypes: datetime64[ns](1), float64(4), int64(2), object(6)
memory usage: 980.0+ KB
```

In [10]:
```
1 Data.describe()
```
executed in 49ms, finished 20:58:56 2024-06-26

Out[10]:

	Retailer ID	Invoice Date	Price per Unit	Units Sold	Total Sales	Operating Profit	Operating Margin
count	9.648000e+03	9648	9648.000000	9648.000000	9648.000000	9648.000000	9648.000000
mean	1.173850e+06	2021-05-10 15:20:44.776119296	45.216625	256.930037	93273.437500	34425.244761	0.422991
min	1.128299e+06	2020-01-01 00:00:00	7.000000	0.000000	0.000000	0.000000	0.100000
25%	1.185732e+06	2021-02-17 00:00:00	35.000000	106.000000	4254.500000	1921.752500	0.350000
50%	1.185732e+06	2021-06-04 00:00:00	45.000000	176.000000	9576.000000	4371.420000	0.410000
75%	1.185732e+06	2021-09-16 00:00:00	55.000000	350.000000	150000.000000	52062.500000	0.490000
max	1.197831e+06	2021-12-31 00:00:00	110.000000	1275.000000	825000.000000	390000.000000	0.800000
std	2.636038e+04	NaN	14.705397	214.252030	141916.016727	54193.113713	0.097197

In [11]:
```
1 len(Data['Retailer'].unique()), Data.Retailer.unique()
```
executed in 21ms, finished 20:58:56 2024-06-26

Out[11]:
```
(6,
 array(['Foot Locker', 'Walmart', 'Sports Direct', 'West Gear', "Kohl's",
        'Amazon'], dtype=object))
```

In [12]:
```
1 len(Data.Product.unique()), Data.Product.unique()
```
executed in 12ms, finished 20:58:56 2024-06-26

Out[12]:
```
(6,
 array(["Men's Street Footwear", "Men's Athletic Footwear",
        "Women's Street Footwear", "Women's Athletic Footwear",
        "Men's Apparel", "Women's Apparel"], dtype=object))
```

In [13]:
```
1 len(Data['Sales Method'].unique()), Data['Sales Method'].unique()
```
executed in 12ms, finished 20:58:56 2024-06-26

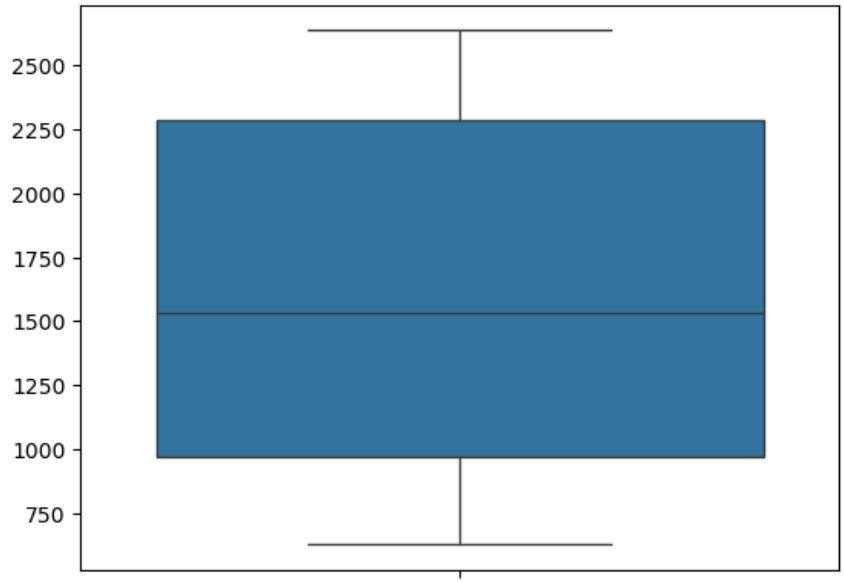
Out[13]:
```
(3, array(['In-store', 'Outlet', 'Online'], dtype=object))
```

In [14]:
```
1 Data["Retailer"].value_counts()
```
executed in 17ms, finished 20:58:56 2024-06-26

Out[14]:
```
Retailer
Foot Locker      2637
West Gear        2374
Sports Direct    2032
Kohl's           1030
Amazon            949
Walmart           626
Name: count, dtype: int64
```

In [15]:
```
1 sns.boxplot(Data['Retailer'].value_counts().values)
```
executed in 443ms, finished 20:58:56 2024-06-26

Out[15]:
```
<Axes: >
```



In [16]:
```
1 print("The Min Date Present is ",Data["Invoice Date"].min())
2 print("The Max Date Present is ",Data["Invoice Date"].max())
3 print("The Total duration of the data is ",Data["Invoice Date"].max()-Data["Invoice Date"].min())
```
executed in 47ms, finished 20:58:56 2024-06-26

```
The Min Date Present is  2020-01-01 00:00:00
The Max Date Present is  2021-12-31 00:00:00
The Total duration of the data is  730 days 00:00:00
```

In [17]:
```
1 Data.City.unique()
```
executed in 14ms, finished 20:58:56 2024-06-26

Out[17]:
```
array(['New York', 'Houston', 'San Francisco', 'Los Angeles', 'Chicago',
       'Dallas', 'Philadelphia', 'Las Vegas', 'Denver', 'Seattle',
       'Miami', 'Minneapolis', 'Billings', 'Knoxville', 'Omaha',
       'Birmingham', 'Portland', 'Anchorage', 'Honolulu', 'Orlando',
       'Albany', 'Cheyenne', 'Richmond', 'Detroit', 'St. Louis',
       'Salt Lake City', 'New Orleans', 'Boise', 'Phoenix', 'Albuquerque',
       'Atlanta', 'Charleston', 'Charlotte', 'Columbus', 'Louisville',
       'Jackson', 'Little Rock', 'Oklahoma City', 'Wichita',
       'Sioux Falls', 'Fargo', 'Des Moines', 'Milwaukee', 'Indianapolis',
       'Baltimore', 'Wilmington', 'Newark', 'Hartford', 'Providence',
       'Boston', 'Burlington', 'Manchester'], dtype=object)
```

In [18]:
```
1 Data["Sales Method"].value_counts()
```
executed in 20ms, finished 20:58:56 2024-06-26

Out[18]:
```
Sales Method
Online      4889
Outlet      3019
In-store    1740
Name: count, dtype: int64
```

In [19]:
```
1 Data.Product.head()
```
executed in 15ms, finished 20:58:56 2024-06-26

Out[19]:
```
0        Men's Street Footwear
1      Men's Athletic Footwear
2      Women's Street Footwear
3    Women's Athletic Footwear
4                Men's Apparel
Name: Product, dtype: object
```

Check Duplicated data

In [20]:
```
1 Data.duplicated().sum()
```
executed in 24ms, finished 20:58:57 2024-06-26

Out[20]:
```
0
```

Check Null values

In [21]:
```
1 Data.isna().sum()
```
executed in 15ms, finished 20:58:57 2024-06-26

Out[21]:
```
Retailer            0
Retailer ID         0
Invoice Date        0
Region              0
State               0
City                0
Product             0
Price per Unit      0
Units Sold          0
Total Sales         0
Operating Profit    0
Operating Margin    0
Sales Method        0
dtype: int64
```

Check the numeric data correctness

Total Sales = Price per Unit * Units Sold

Operating Profit = Total Sales * Operating Margin

Let's check if these values are correct in the dataset

In [22]:
```
1 Data['Calculated Total Sales'] = Data['Price per Unit'] * Data['Units Sold']
```
executed in 9ms, finished 20:58:57 2024-06-26

In [23]:
```
1 Data['Calculated Operating Profit'] = Data['Calculated Total Sales'] * Data['Operating Margin']
```
executed in 7ms, finished 20:58:57 2024-06-26

In [24]:
```
1 incorrect_total_sales = (~Data['Calculated Total Sales'].eq(Data['Total Sales'])).sum()
```
executed in 9ms, finished 20:58:57 2024-06-26

In [25]:
```
1 incorrect_operating_profit = (~Data['Calculated Operating Profit'].eq(Data['Operating Profit'])).sum()
```
executed in 9ms, finished 20:58:57 2024-06-26

In [26]:
```
1 incorrect_total_sales, incorrect_operating_profit
```
executed in 13ms, finished 20:58:57 2024-06-26

Out[26]:
```
(3886, 3887)
```

In [27]:
```
1 Data['Total Sales'] = Data['Calculated Total Sales']
2 Data['Operating Profit'] = Data['Calculated Operating Profit']
3 Data = Data.drop(columns=['Calculated Total Sales', 'Calculated Operating Profit'])
```
executed in 18ms, finished 20:58:57 2024-06-26

Let's Add additional Columns

In [28]:
```
Data['Week Day'] = Data['Invoice Date'].dt.day_name()
Data['Month'] = Data['Invoice Date'].dt.strftime("%B")
Data['Year'] = Data['Invoice Date'].dt.year
Data['Season'] = Data['Month'].apply(lambda x: 'Winter' if (x  in [1, 2, 12]) else
                                               'Spring' if (x in [3, 4, 5]) else
                                               'Summer' if (x in [6, 7, 8]) else
                                               'Autumn')
Data['Month Year'] = Data['Invoice Date'].dt.to_period('M').astype('datetime64[ns]')
```

executed in 284ms, finished 20:58:57 2024-06-26

In [29]:
```
Data[['Type', 'Group']] = Data['Product'].str.extract(r"(Men's|Women's)\s(.*)")
```

executed in 77ms, finished 20:58:57 2024-06-26

In [30]:
```
Data.Region.value_counts()
```

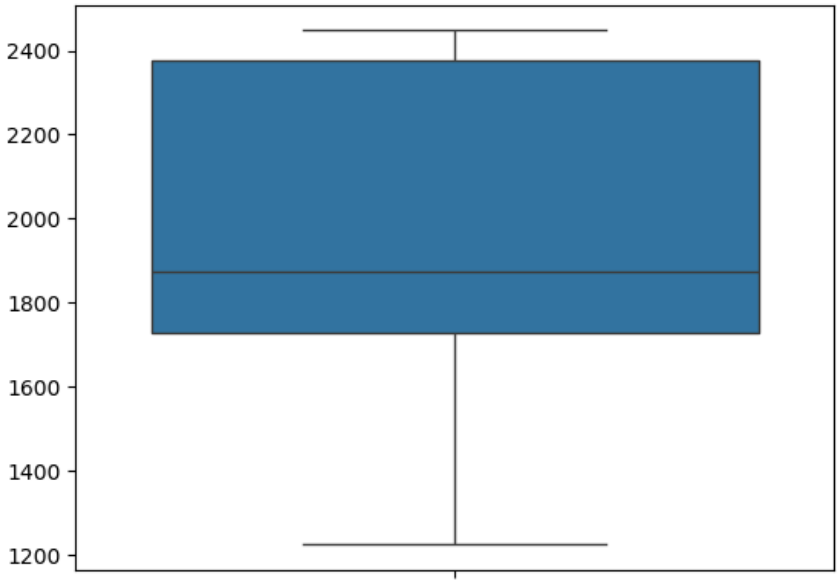
executed in 21ms, finished 20:58:57 2024-06-26

Out[30]:
```
Region
West         2448
Northeast    2376
Midwest      1872
South        1728
Southeast    1224
Name: count, dtype: int64
```

In [31]:
```
sns.boxplot(Data["Region"].value_counts().values)
```

executed in 341ms, finished 20:58:57 2024-06-26

Out[31]: <Axes: >



In [32]:
```
1 Data["State"].value_counts()
```

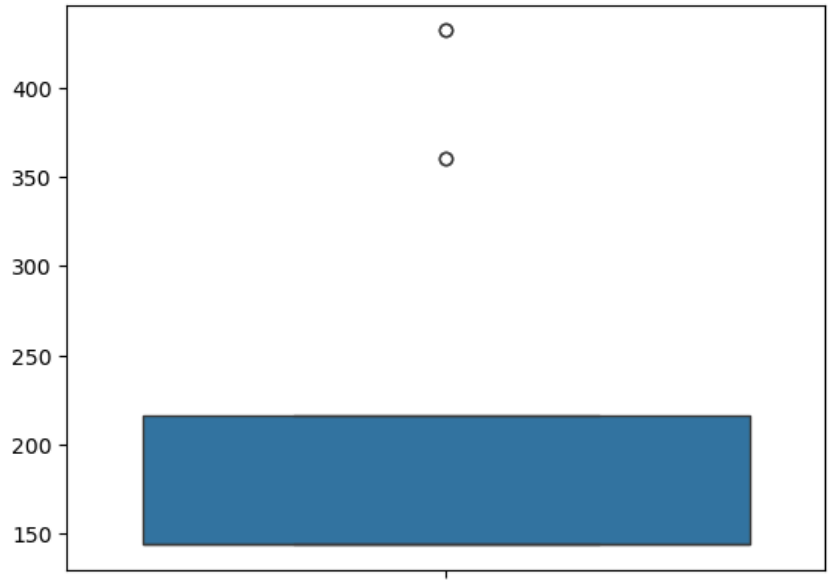
executed in 16ms, finished 20:58:57 2024-06-26

Out[32]:

```
State
California        432
Texas             432
New York          360
Florida           360
Mississippi       216
Oregon            216
Louisiana         216
Idaho             216
New Mexico        216
Georgia           216
Arkansas          216
Virginia          216
Oklahoma          216
Connecticut       216
Rhode Island      216
Massachusetts     216
Vermont           216
Utah              216
Arizona           216
New Hampshire     216
Pennsylvania      216
Nevada            216
Alabama           216
Tennessee         216
South Dakota      144
Illinois          144
Colorado          144
New Jersey        144
Delaware          144
Maryland          144
West Virginia     144
Indiana           144
Wisconsin         144
Iowa              144
North Dakota      144
Michigan          144
Kansas            144
Missouri          144
Minnesota         144
Montana           144
Kentucky          144
Ohio              144
North Carolina    144
South Carolina    144
Nebraska          144
Maine             144
Alaska            144
Hawaii            144
Wyoming           144
Washington        144
Name: count, dtype: int64
```

In [33]:
```
1 sns.boxplot(Data["State"].value_counts().values)
```
executed in 317ms, finished 20:58:58 2024-06-26

Out[33]: <Axes: >

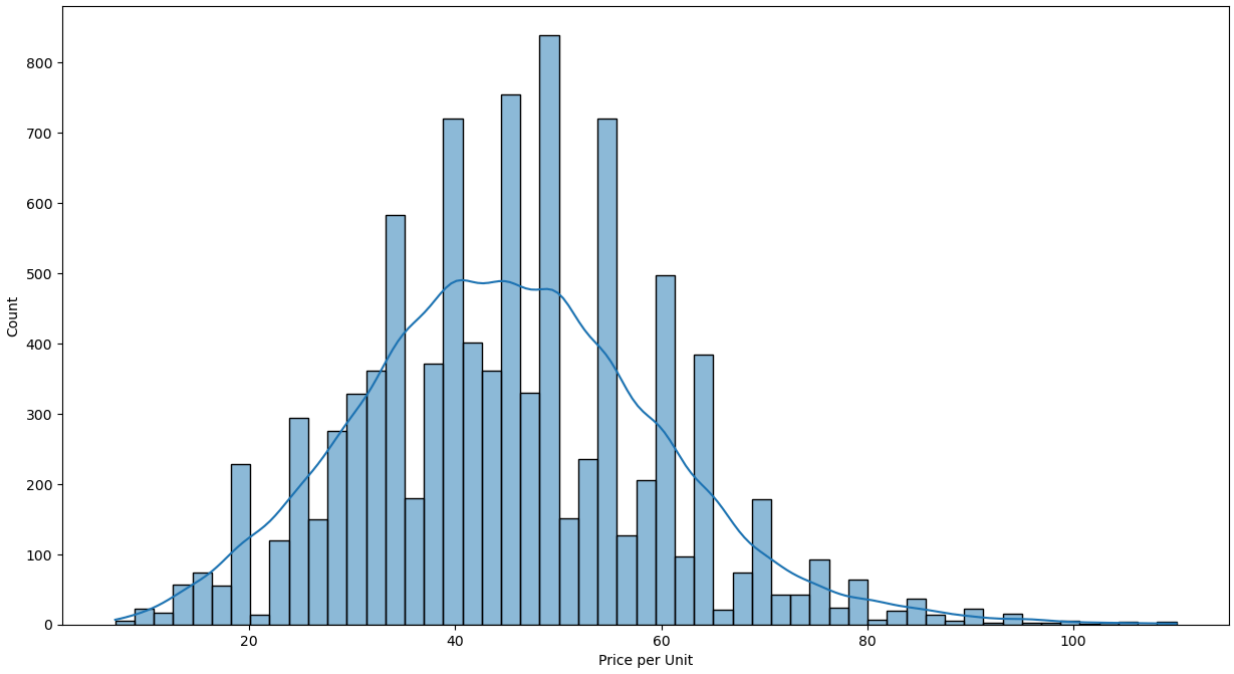


In [34]:
```
1 Data.Product.value_counts()
```
executed in 20ms, finished 20:58:58 2024-06-26

Out[34]:
```
Product
Men's Street Footwear        1610
Men's Athletic Footwear      1610
Women's Street Footwear      1608
Women's Apparel              1608
Women's Athletic Footwear    1606
Men's Apparel                1606
Name: count, dtype: int64
```

In [35]:
```
1 plt.figure(figsize = (15,8))
2 sns.histplot(Data["Price per Unit"],kde=True)
```
executed in 1.02s, finished 20:58:59 2024-06-26

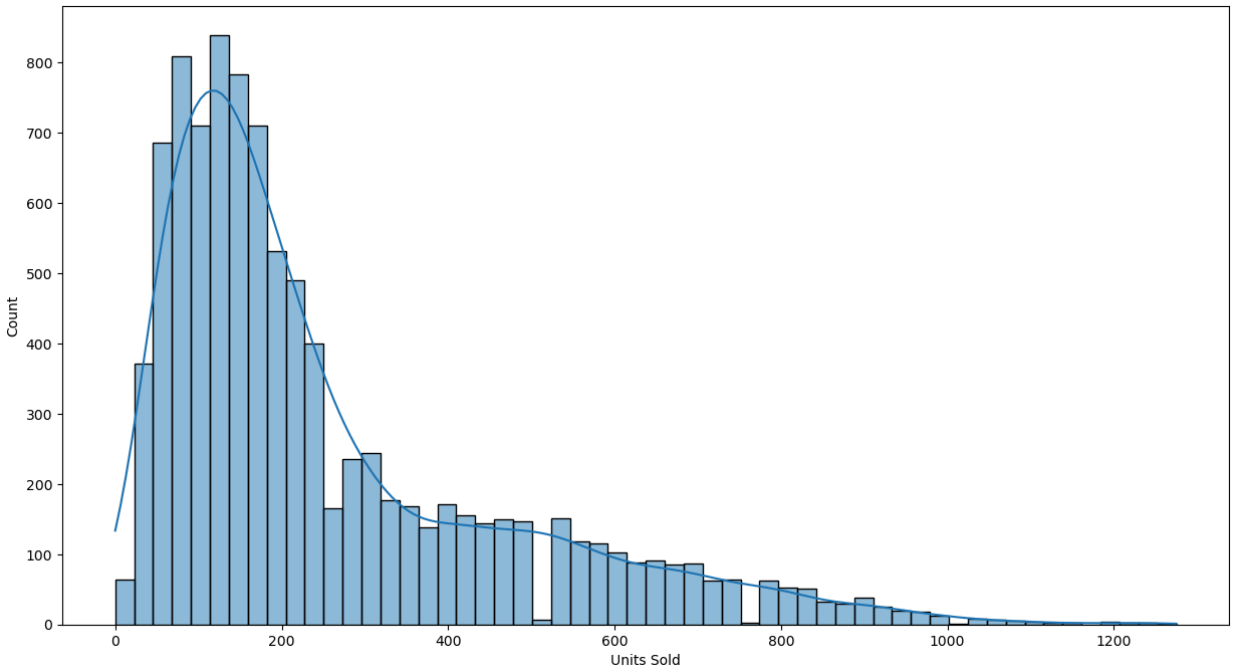
Out[35]: <Axes: xlabel='Price per Unit', ylabel='Count'>



In [36]:
```
plt.figure(figsize = (15,8))
sns.histplot(Data["Units Sold"], kde=True)
```

executed in 1.00s, finished 20:59:00 2024-06-26

Out[36]: <Axes: xlabel='Units Sold', ylabel='Count'>



Top Selling Product

In [37]:
```
top_selling_product = Data.groupby('Product')['Total Sales'].sum().sort_values(ascending = False).rese
top_selling_product.index+=1
```

executed in 21ms, finished 20:59:00 2024-06-26

In [38]:
```
top_selling_product
```

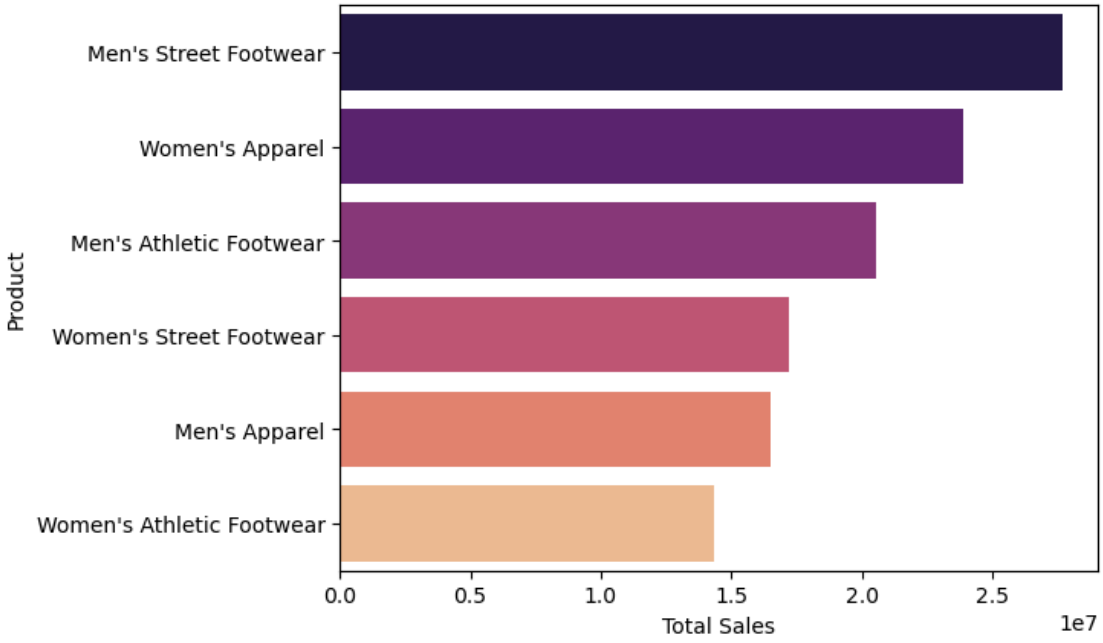
executed in 30ms, finished 20:59:00 2024-06-26

Out[38]:

	Product	Total Sales
1	Men's Street Footwear	27680769.0
2	Women's Apparel	23870985.0
3	Men's Athletic Footwear	20577180.0
4	Women's Street Footwear	17201563.0
5	Men's Apparel	16520632.0
6	Women's Athletic Footwear	14315521.0

In [39]:
```
sns.barplot(data= top_selling_product, x = 'Total Sales', y = 'Product', palette='magma')
plt.show()
```

executed in 527ms, finished 20:59:00 2024-06-26



Top Cities

In [40]:
```
# TOP CITIES

grossing_cities = Data.groupby('City')['Operating Profit'].sum().sort_values(ascending=False).reset_in
grossing_cities.index+=1
```

executed in 20ms, finished 20:59:00 2024-06-26

In [41]:
```
grossing_cities
```

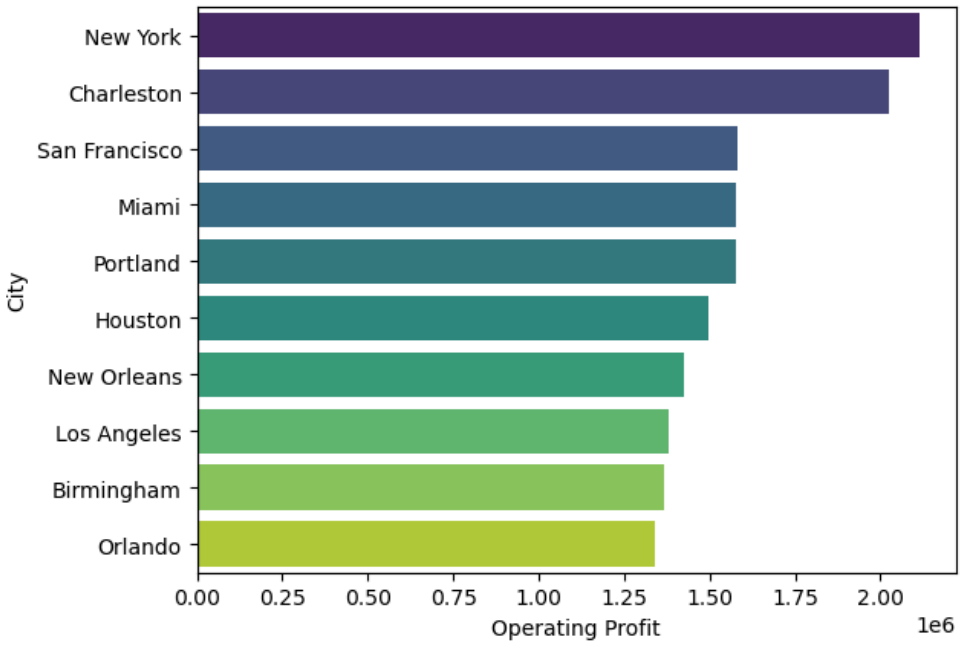
executed in 49ms, finished 20:59:01 2024-06-26

Out[41]:

	City	Operating Profit
1	New York	2114664.41
2	Charleston	2024086.36
3	San Francisco	1581993.31
4	Miami	1579387.86
5	Portland	1575860.62
6	Houston	1494772.31
7	New Orleans	1424389.74
8	Los Angeles	1378158.34
9	Birmingham	1368206.39
10	Orlando	1342206.56

In [42]:
```
sns.barplot(data = grossing_cities, y= 'City', x = 'Operating Profit', palette='viridis')
plt.show()
```

executed in 722ms, finished 20:59:01 2024-06-26



TOP RETAILERS

In [43]:
```
# TOP RETAILERS

top_retailers = Data.groupby('Retailer')['Total Sales'].sum().sort_values(ascending=False).reset_index
top_retailers.index+=1
```

executed in 20ms, finished 20:59:01 2024-06-26

In [44]:
```
top_retailers
```

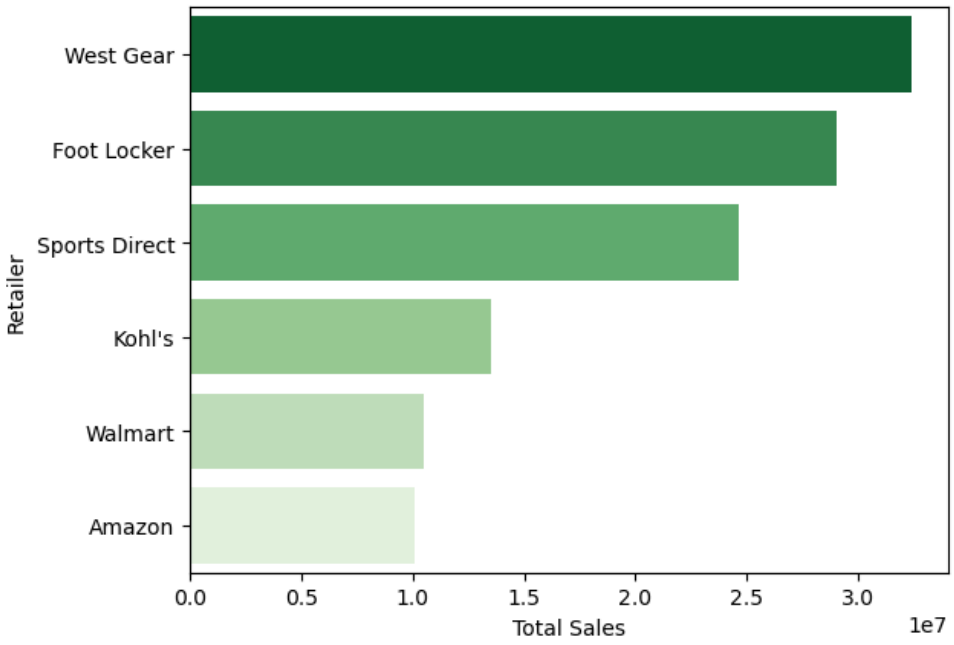
executed in 40ms, finished 20:59:01 2024-06-26

Out[44]:

	Retailer	Total Sales
1	West Gear	32409558.0
2	Foot Locker	29024945.0
3	Sports Direct	24616622.0
4	Kohl's	13512453.0
5	Walmart	10506085.0
6	Amazon	10096987.0

In [45]:
```
sns.barplot(data=top_retailers,y='Retailer',x='Total Sales',palette='Greens_r')
plt.show()
```

executed in 514ms, finished 20:59:02 2024-06-26



Region

In [46]:
```
retailer_region = Data.groupby('Region')['Retailer ID'].count()
```

executed in 15ms, finished 20:59:02 2024-06-26

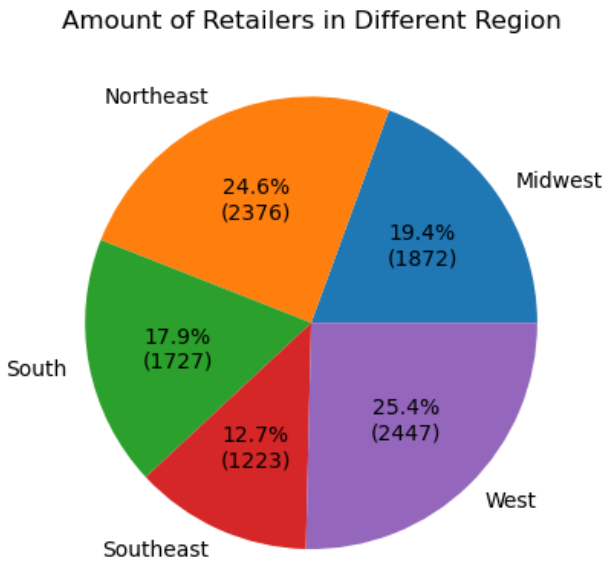
In [47]:
```
retailer_region
```

executed in 38ms, finished 20:59:02 2024-06-26

Out[47]:
```
Region
Midwest      1872
Northeast    2376
South        1728
Southeast    1224
West         2448
Name: Retailer ID, dtype: int64
```

In [48]:
```
plt.pie(retailer_region, labels=retailer_region.index, autopct=lambda pct : f'{pct:.1f}%\n({int(pct/10
plt.title("Amount of Retailers in Different Region")
plt.show()
```

executed in 361ms, finished 20:59:02 2024-06-26



In [49]:
```
region_sales = Data.groupby('Region')['Total Sales'].sum()
```

executed in 18ms, finished 20:59:02 2024-06-26

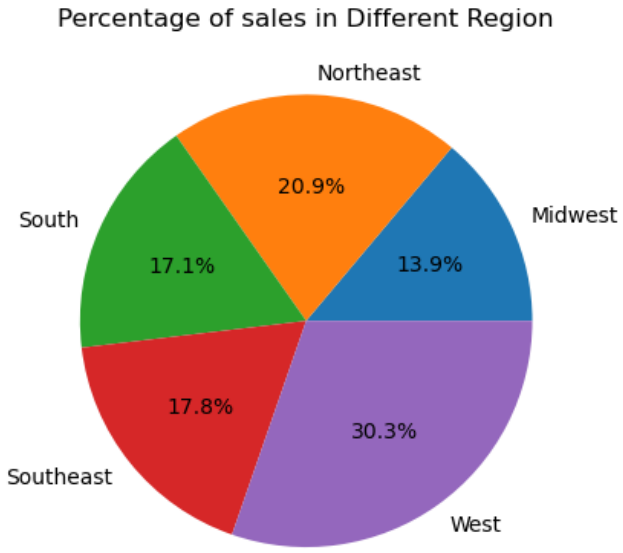
In [50]:
```
region_sales
```

executed in 18ms, finished 20:59:02 2024-06-26

Out[50]:
```
Region
Midwest      16674434.0
Northeast    25078267.0
South        20603356.0
Southeast    21374436.0
West         36436157.0
Name: Total Sales, dtype: float64
```

In [51]:
```
plt.pie(region_sales, labels=region_sales.index, autopct='%1.1f%%')
plt.title('Percentage of sales in Different Region')
plt.show()
```

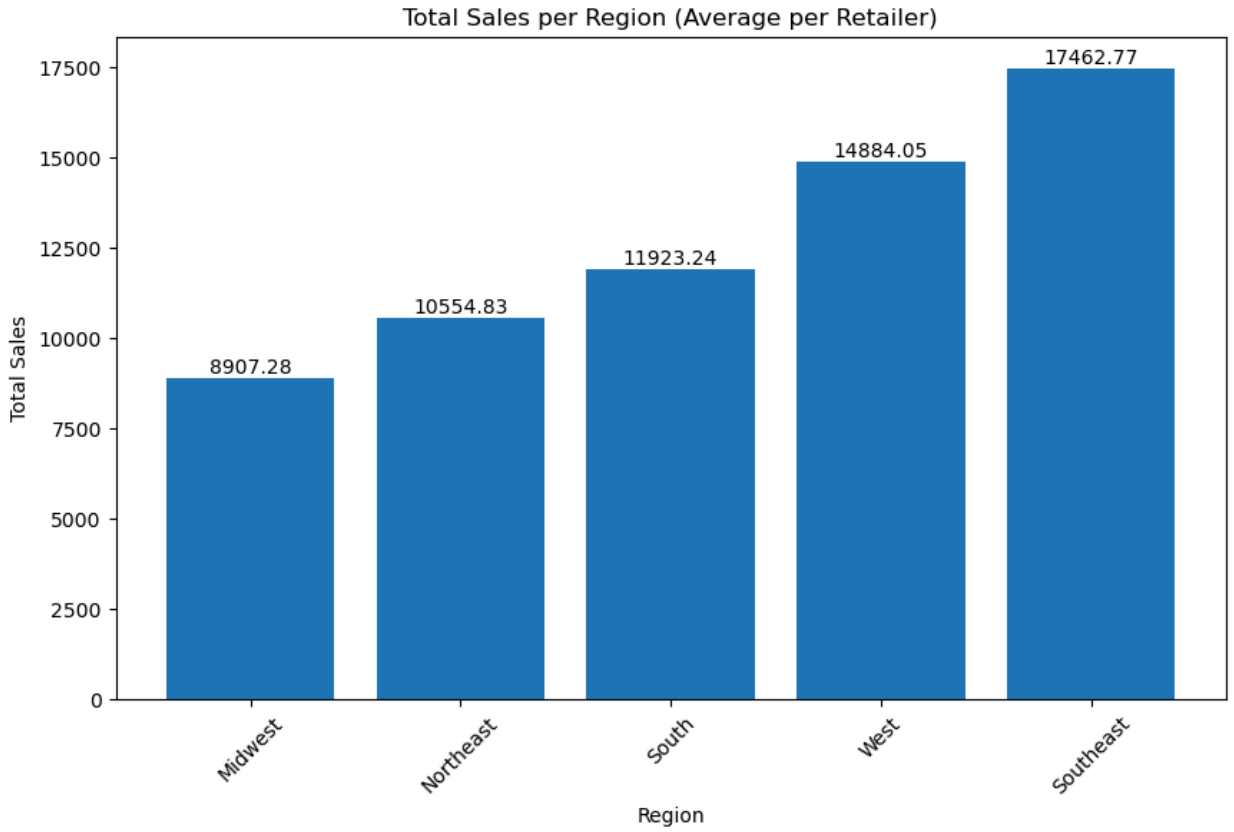
executed in 311ms, finished 20:59:03 2024-06-26



In [52]:

```
adidas = Data.groupby('Region')['Total Sales'].sum().divide(Data.groupby('Region')['Retailer ID'].coun
# Create a bar chart
plt.figure(figsize=(10, 6))
plt.bar(adidas.index, adidas.values)

# Add labels to each bar
for i, value in enumerate(adidas.values):
    plt.text(i, value, str(round(value, 2)), ha='center', va='bottom')

# Add titles and labels
plt.title('Total Sales per Region (Average per Retailer)')
plt.xlabel('Region')
plt.ylabel('Total Sales')

# Rotate x-axis labels for better readability
plt.xticks(rotation=45)

# Display the chart
plt.show()
print(adidas)
```

executed in 588ms, finished 20:59:03 2024-06-26



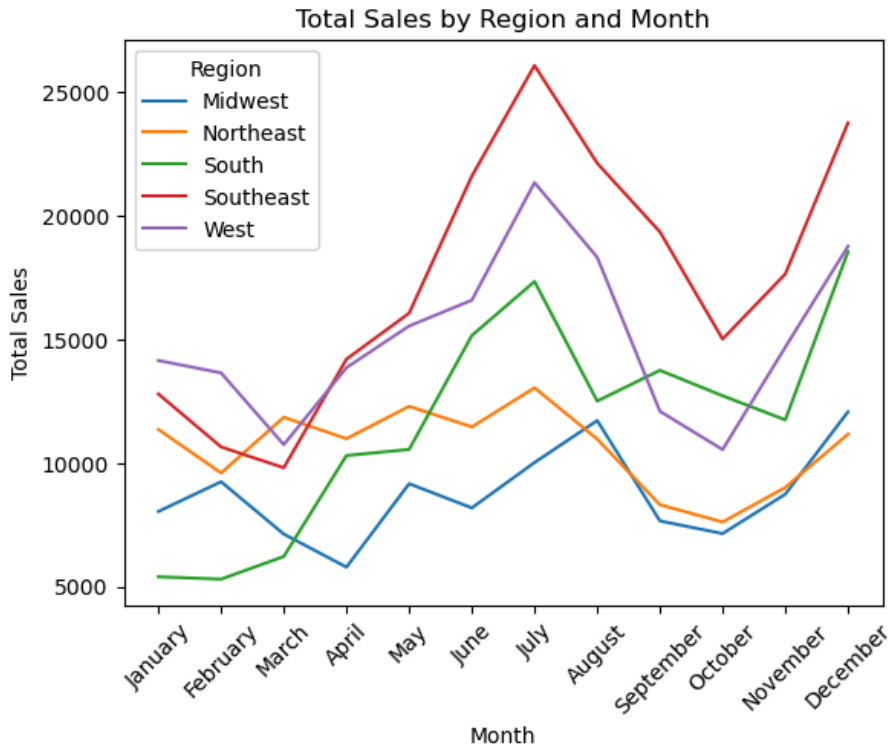

```
Region
Midwest       8907.283120
Northeast    10554.826178
South        11923.238426
West         14884.051062
Southeast    17462.774510
dtype: float64
```

- I fount that in Southeast Region we have bigest sales per Retailer*
- Bigest Amoun of retailers we have at West (25%)*
- And bigest sales per region we have at West (30%)*

In [53]:

```
adidas_southeast = Data.pivot_table(values='Total Sales', index='Month', columns='Region', fill_value=

# Define the order of months
month_order = ['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August', 'September',

# Reindex the pivot table with the defined month order
adidas_southeast = adidas_southeast.reindex(month_order)

# Plotting the pivot table
adidas_southeast.plot.line()
plt.xticks(range(len(adidas_southeast.index)), adidas_southeast.index)

# Adding labels and title
plt.xlabel('Month')
plt.ylabel('Total Sales')
plt.title('Total Sales by Region and Month')
plt.xticks(rotation=45)
# Display the plot
plt.show()
```

executed in 994ms, finished 20:59:04 2024-06-26



- We have an increas in Sales at Summer times and close to Christmas Holidays*
- We have two supper performing region and two underperformin and also one with average performans*

Close look to the best performing Region (SouthEast Region) and what States are include in it

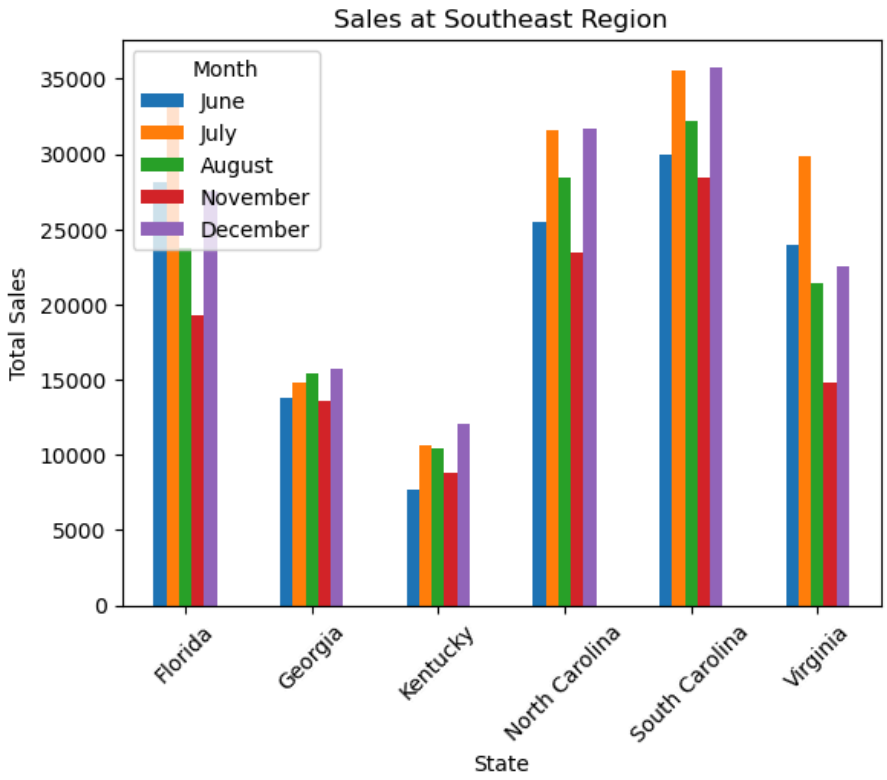
In [54]:

```
adidas_states = Data.pivot_table(values='Total Sales', index=['Region','State'], columns='Month', fill
region = 'Southeast'

months = ['June', 'July', 'August', 'November', 'December']

Southeast_data = adidas_states.loc[region, months].round(2)
Southeast_data.plot.bar()
plt.xlabel('State')
plt.ylabel('Total Sales')
plt.title('Sales at Southeast Region')
plt.xticks(rotation=45)
Southeast_data
```

executed in 1.08s, finished 20:59:05 2024-06-26

Out[54]:

Month	June	July	August	November	December
State					
Florida	28175.06	33824.00	23750.15	19264.67	27519.17
Georgia	13789.94	14806.06	15470.06	13628.61	15732.22
Kentucky	7718.92	10654.50	10433.17	8827.92	12039.00
North Carolina	25457.17	31595.50	28471.92	23482.67	31677.58
South Carolina	29969.33	35572.42	32238.33	28394.83	35799.75
Virginia	23971.72	29899.50	21455.06	14846.78	22506.28

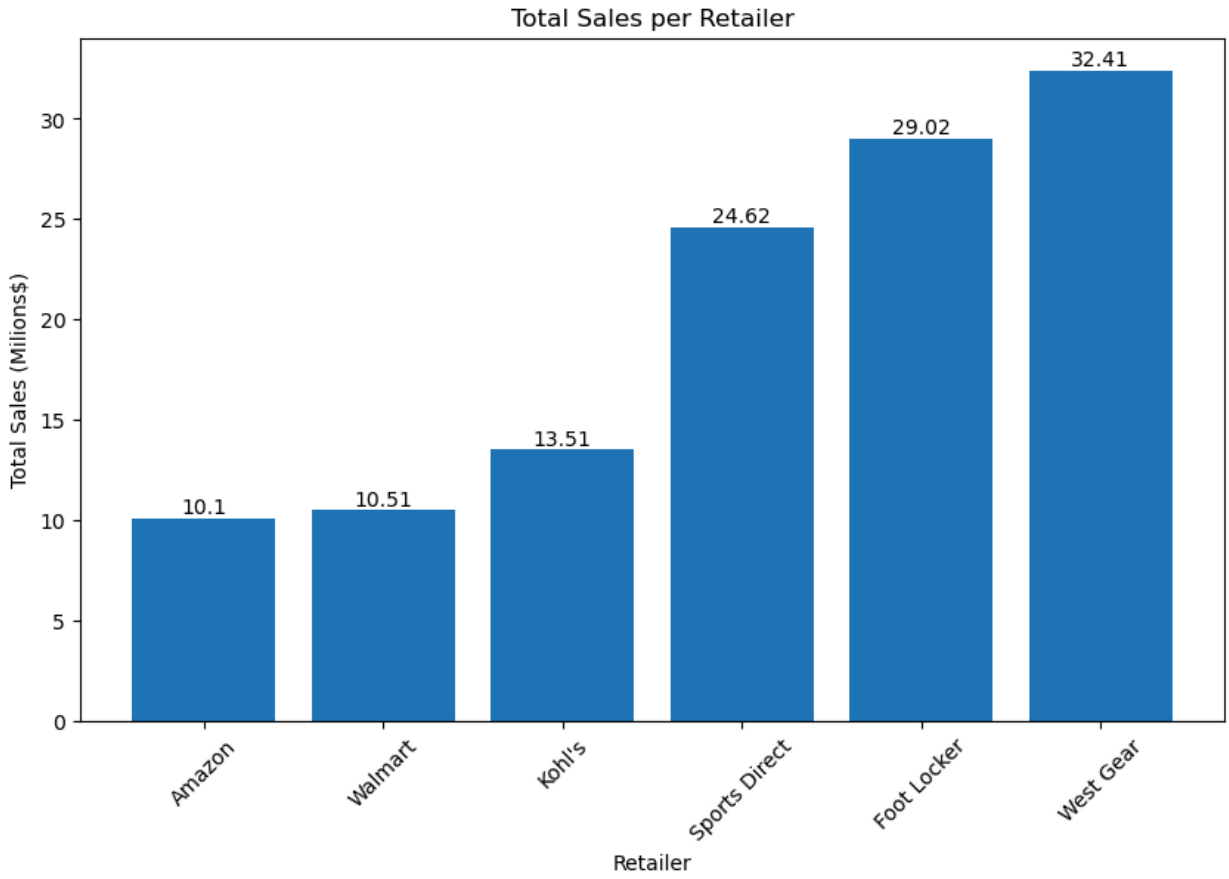


Investigation about retailers

In [55]:

```
adidas_most=Data.groupby('Retailer')['Total Sales'].sum().sort_values()
adidas_most_milions=adidas_most/1000000

plt.figure(figsize=(10, 6))
plt.bar(adidas_most_milions.index, adidas_most_milions.values)

# Add labels to each bar
for i, value in enumerate(adidas_most_milions.values):
    plt.text(i, value, str(round(value, 2)), ha='center', va='bottom')

# Add titles and labels
plt.title('Total Sales per Retailer')
plt.xlabel('Retailer')
plt.ylabel('Total Sales (Milions$)')

# Rotate x-axis labels for better readability
plt.xticks(rotation=45)

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

executed in 602ms, finished 20:59:06 2024-06-26



In [56]:

```
adidas_2020=Data[Data['Year']==2020]
adidas_2021=Data[Data['Year']==2021]

adidas_retailer_2020=pd.pivot_table(adidas_2020,values='Total Sales',index=['Month'],columns='Retailer
adidas_retailer_Thousands_2020=(adidas_retailer_2020/1000).round(2)

adidas_retailer_2021=pd.pivot_table(adidas_2021,values='Total Sales',index=['Month'],columns='Retailer
adidas_retailer_Thousands_2021=(adidas_retailer_2021/1000).round(2)

adidas_retailer_Thousands_2020=adidas_retailer_Thousands_2020.reindex(month_order)
adidas_retailer_Thousands_2021=adidas_retailer_Thousands_2021.reindex(month_order)
fig, axes = plt.subplots(2, 1, figsize=(10, 8))

axes[0].plot(adidas_retailer_Thousands_2020.index, adidas_retailer_Thousands_2020[['Walmart','Sports D
             label=['Walmart','Sports Direct','Foot Locker','West Gear'])
axes[0].plot(adidas_retailer_Thousands_2020.index, adidas_retailer_Thousands_2020["Kohl's"], label="Ko
# Add more lines for other retailers as needed
axes[0].set_title('Total Sales in 2020')
axes[0].set_xlabel('Month')
axes[0].set_ylabel('Sales (Thousands)')
axes[0].legend()

axes[1].plot(adidas_retailer_Thousands_2021.index, adidas_retailer_Thousands_2021[['Amazon','Walmart',
             label=['Amazon','Walmart','Sport Direct','Foot Locker','West Gear'])
axes[1].plot(adidas_retailer_Thousands_2021.index, adidas_retailer_Thousands_2021["Kohl's"], label="Ko
# Add more lines for other retailers as needed
axes[1].set_title('Total Sales in 2021')
axes[1].set_xlabel('Month')
axes[1].set_ylabel('Sales (Thousands)')
axes[1].legend()

plt.tight_layout()
plt.show()
```

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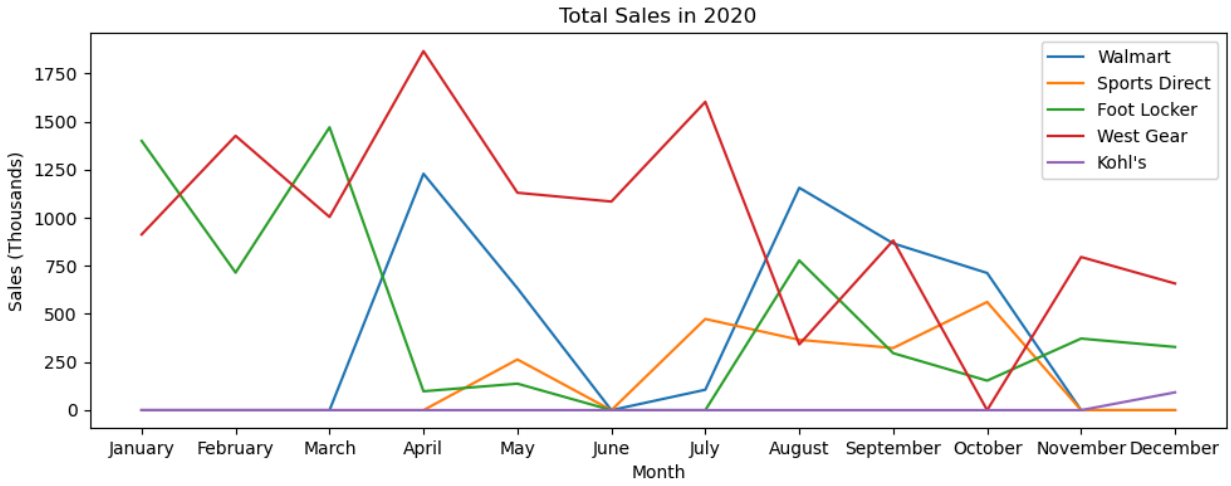

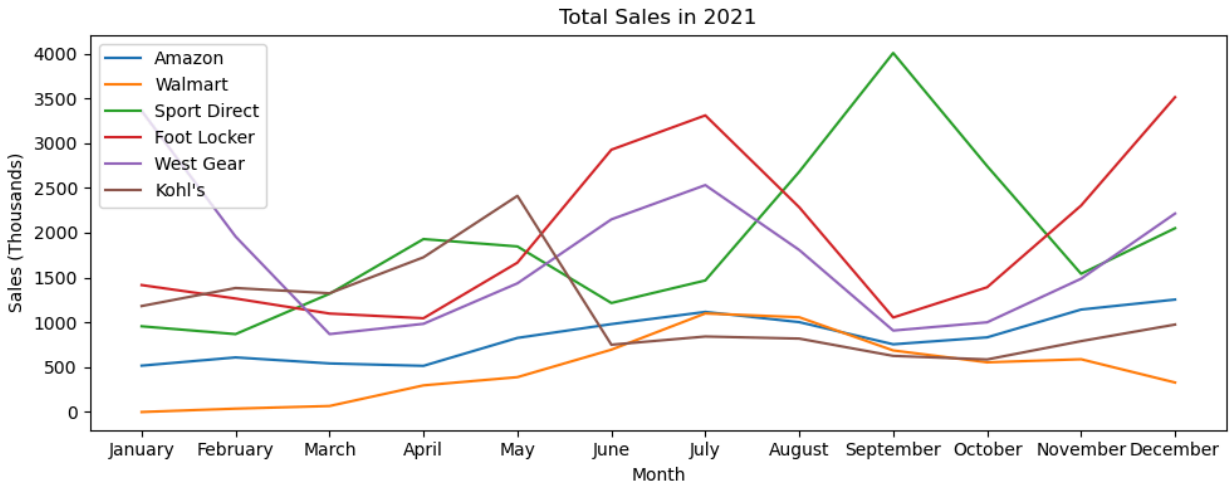

For 2021

1. From our observation we can see that most summer sales appeared at "Foot Locker"& "West Gear"

2. But in same time we have outliers like "Sport Direct" which has an increase in sales at September while other retailers have decrease in sales
3. We have also "West Gear" one more outlier that has good sales at January

In 2020 we dont have much data to make a proper seasonal sales analysis about all retailers but with what we have "West Gear" leader in sales at summer and April (I thin it was in times of lockdown)

It is enough for regional and retailer analysis for basic understanding of trend performance in regions and what season and retailer best performer in which month

Product

In [57]:
```
adidas_product_m=(Data.groupby(["Product"])['Total Sales'].sum()/1000000).round(2).sort_values()

colors = ['blue', 'green', 'orange', 'red']

# Create a horizontal bar chart
plt.figure(figsize=(10, 6))
plt.barh(np.arange(len(adidas_product_m)), adidas_product_m.values, color=colors)

# Add labels to each bar
for i, (retailer, value) in enumerate(adidas_product_m.items()):
    plt.text(value, i, str(round(value, 2)), ha='left', va='center')

# Add titles and labels
plt.title('Total Sales per Product')
plt.xlabel('Total Sales (Millions $)')
plt.ylabel('Retailer')

# Set y-axis ticks and labels
plt.yticks(np.arange(len(adidas_product_m)), adidas_product_m.keys())

# Display the chart
plt.show()


```

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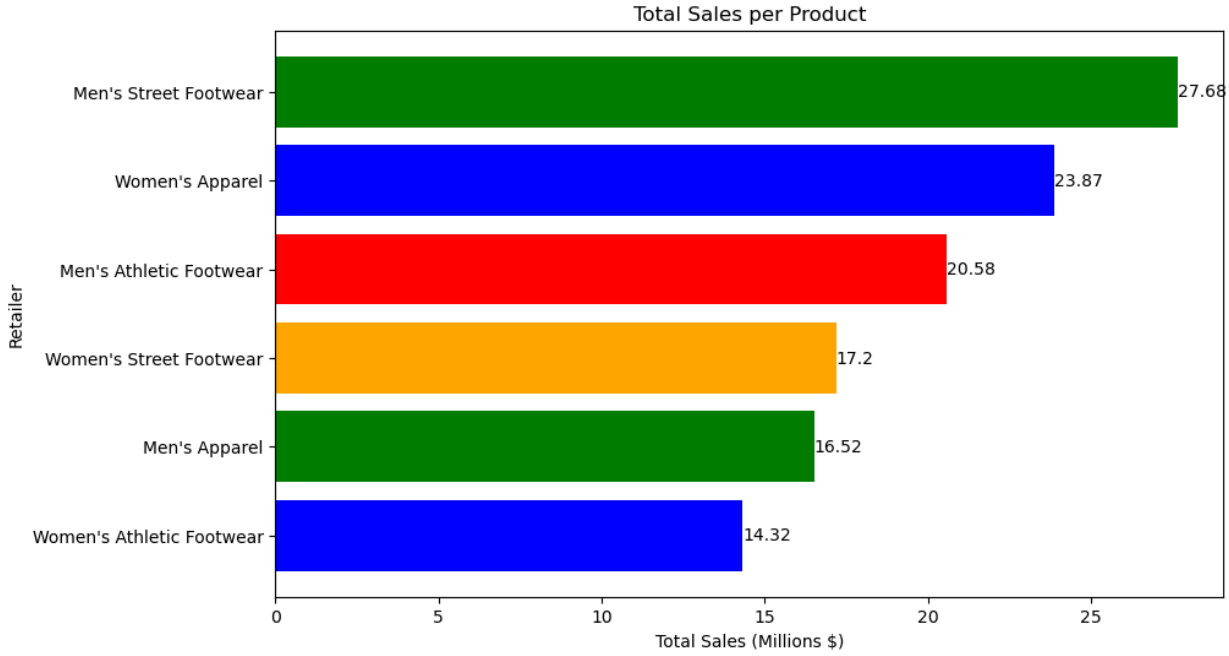


We found top Sales Product in Adidas company for last two years

In [58]:

```
adidas_product_retailer_k=(Data.pivot_table(values='Total Sales',index='Retailer',columns='Product',ag

# Create heatmap
plt.figure(figsize=(10, 6))  # Adjust the figure size if needed
sns.heatmap(adidas_product_retailer_k, annot=True, fmt=".2f", cmap="YlGnBu")

# Set plot title and labels
plt.title("Average Sales Performance for Different Products Across Various Retailers(Thousand)")
plt.xlabel("Product")
plt.ylabel("Retailer")
plt.xticks(rotation=45)
plt.yticks(rotation=45)
# Show the plot
plt.show()
```

executed in 959ms, finished 20:59:09 2024-06-26

1. Best selling product in average (Men's Street Footwear) in all our retailers

2. Also Walmart have a good performans in seling all of our products in average .

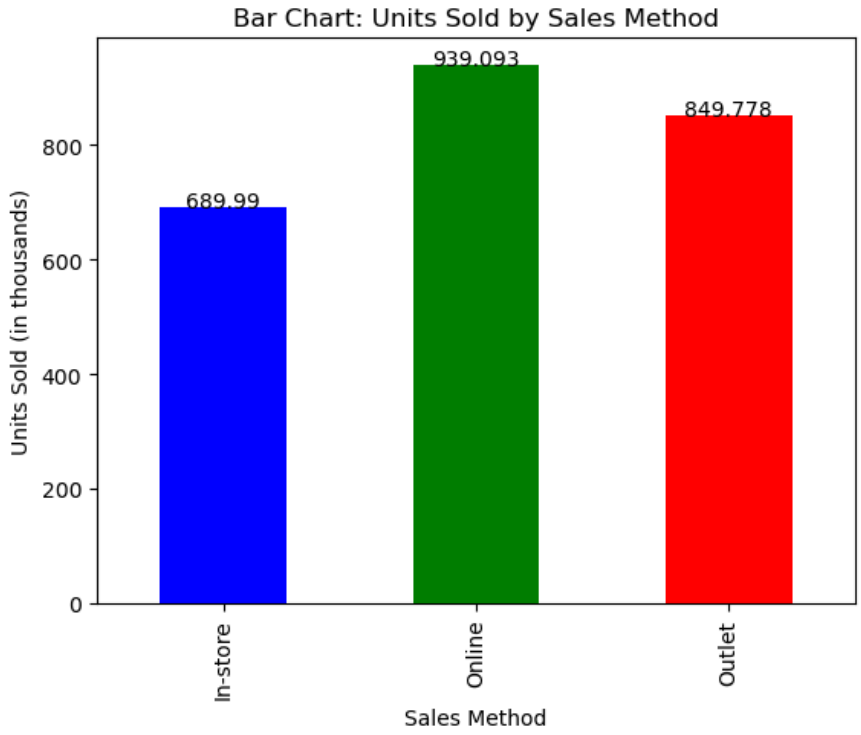
3. There is tree type of most selled average product in all our retailers and its (Men's Street Footwear,Women's Apparel,Men's Athletic Footwear)

Sales Methods

In [59]:

```
adidas_type_qunatity_k= Data.groupby('Sales Method')['Units Sold'].sum()/1000

colors = ['blue', 'green', 'red']
ax = adidas_type_qunatity_k.plot(kind='bar', color=colors)

# Adding labels and title to the plot
plt.xlabel('Sales Method')
plt.ylabel('Units Sold (in thousands)')
plt.title('Bar Chart: Units Sold by Sales Method')

# Adding value labels to the bars
for i, v in enumerate(adidas_type_qunatity_k):
    ax.text(i, v + 0.5, str(v), ha='center')

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

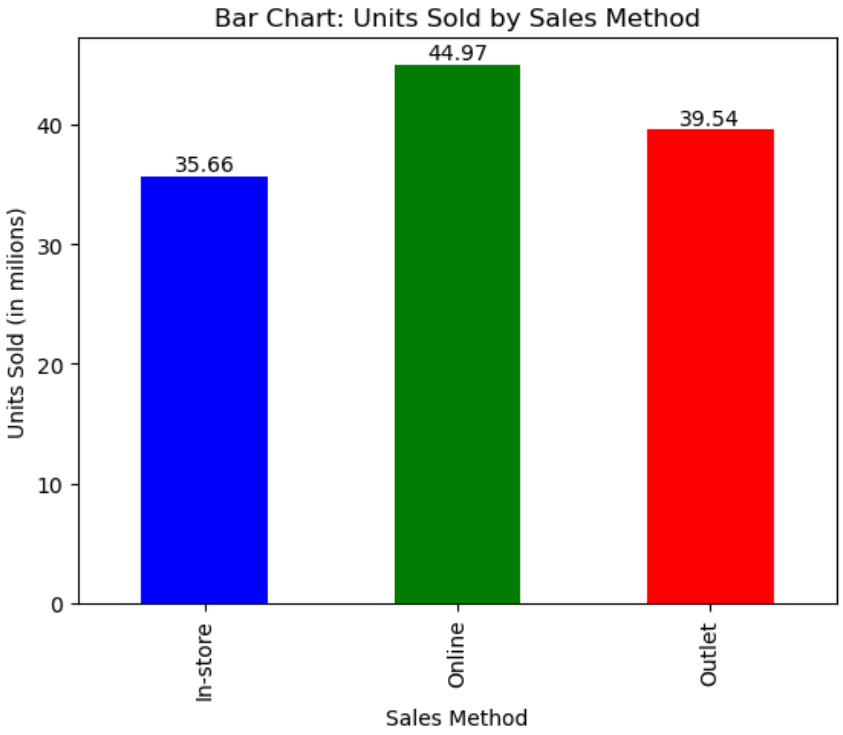
executed in 362ms, finished 20:59:10 2024-06-26



In [60]:

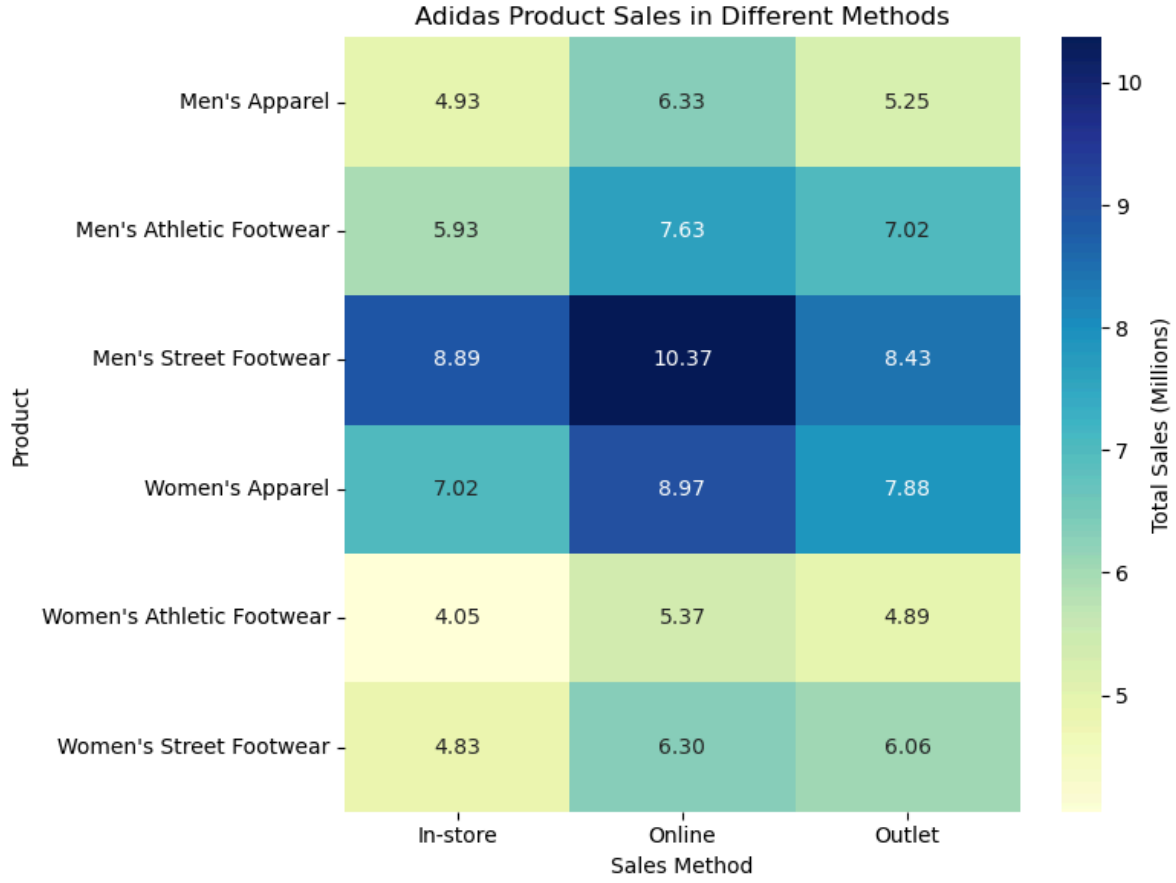
```
adidas_type_sales_m= (Data.groupby('Sales Method')['Total Sales'].sum()/1000000).round(2)

colors = ['blue', 'green', 'red']
ax = adidas_type_sales_m.plot(kind='bar', color=colors)

# Adding labels and title to the plot
plt.xlabel('Sales Method')
plt.ylabel('Units Sold (in milions)')
plt.title('Bar Chart: Units Sold by Sales Method')

# Adding value labels to the bars
for i, v in enumerate(adidas_type_sales_m):
    ax.text(i, v + 0.5, str(v), ha='center')

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

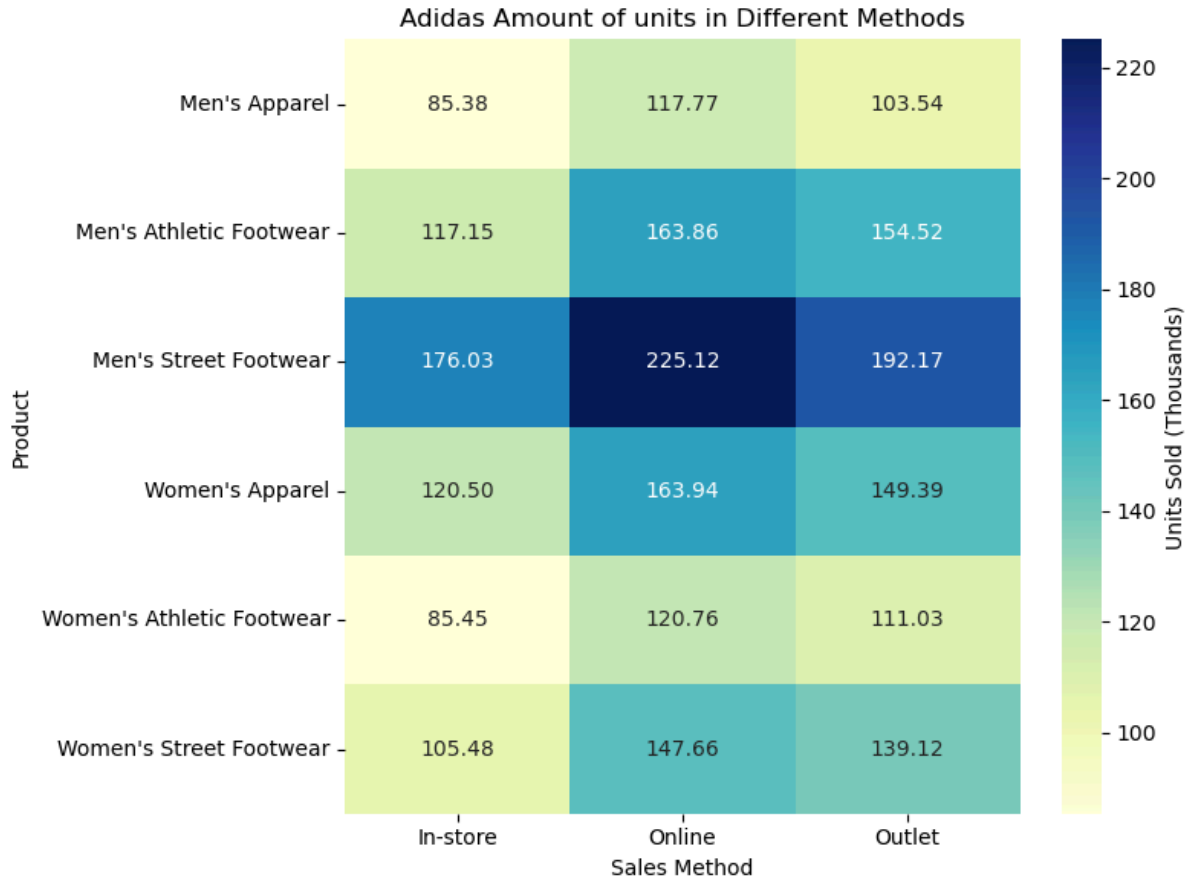
executed in 421ms, finished 20:59:10 2024-06-26



In [61]:
```
as_product_perunit=(Data.pivot_table(values='Total Sales',index=['Product'],columns='Sales Method',aggfunc=
as_product_unit=(Data.pivot_table(values='Units Sold',index=['Product'],columns='Sales Method',aggfunc=np.su

figure(figsize=(8, 6))
heatmap(adidas_product_perunit, annot=True, cmap="YlGnBu", fmt=".2f", cbar_kws={'label': 'Total Sales (Milli
title('Adidas Product Sales in Different Methods')
xlabel('Sales Method')
ylabel('Product')
tight_layout()
show()

# Create the heatmap for adidas_product_unit
figure(figsize=(8, 6))
heatmap(adidas_product_unit, annot=True, cmap="YlGnBu", fmt=".2f", cbar_kws={'label': 'Units Sold (Thousands
title('Adidas Amount of units in Different Methods')
xlabel('Sales Method')
ylabel('Product')
tight_layout()
show()
```

executed in 1.88s, finished 20:59:12 2024-06-26





1. Retailer and Region with the Most Sales:

The Southeast region has the highest sales per retailer, followed by the West region. The West region has the highest total sales among all regions.

2. Macro Trends in Sales:

There is a seasonal component to Adidas sales, with an increase in sales during the summer months and close to Christmas holidays. There are two high-performing regions (Southeast and West) and two underperforming regions, while one region has an average performance.

3. Top Selling Products:

Best selling product in average (Men's Street Footwear) in all our retailers

Also Walmart have a good performans in seling all of our products in average .

There is tree type of most selled average product in all our retailers and its (Men's Street Footwear,Women's Apparel,Men's Athletic Footwear)

4. Top Sales Method:

Its appear that with less quantity of sales in-shop they produce more income then online and outlets.What is very weird for me always thought the online and outlets produce more profit than store selling

5. Retailer Analysis:

The Southeast region consists of states like Florida, Georgia, Kentucky, North Carolina, South Carolina, and Virginia, which contribute significantly to sales in that region. Some retailers have higher total sales than others, but a comprehensive analysis of retailer performance requires further examination.

Sales BY MONTH

In [62]:
```
sales_by_month= Data.groupby(['Month','Year'])['Total Sales'].sum().sort_index(ascending=True).reset_i
sales_by_month.index+=1
```

executed in 20ms, finished 20:59:12 2024-06-26

In [63]:
```
sales_by_month
```
executed in 45ms, finished 20:59:12 2024-06-26

Out[63]:

	Month	Year	Total Sales
1	April	2020	3193081.0
2	April	2021	6498339.0
3	August	2020	2641630.0
4	August	2021	9651596.0
5	December	2020	1079202.0
6	December	2021	10336130.0
7	February	2020	2140813.0
8	February	2021	6123040.0
9	January	2020	2312746.0
10	January	2021	7432021.0
11	July	2020	2182388.0
12	July	2021	10368031.0
13	June	2020	1084194.0
14	June	2021	8718953.0
15	March	2020	2474202.0
16	March	2021	5220782.0
17	May	2020	2164764.0
18	May	2021	8576956.0
19	November	2020	1168050.0
20	November	2021	7855390.0
21	October	2020	1428569.0
22	October	2021	7110189.0
23	September	2020	2367686.0
24	September	2021	8037898.0

In [64]:
```
import plotly.express as px
line = Data.groupby('Invoice Date')[['Total Sales','Operating Profit']].sum().reset_index()
line.index+=1
```
executed in 1.41s, finished 20:59:13 2024-06-26

In [65]:
```
line
```
executed in 31ms, finished 20:59:14 2024-06-26

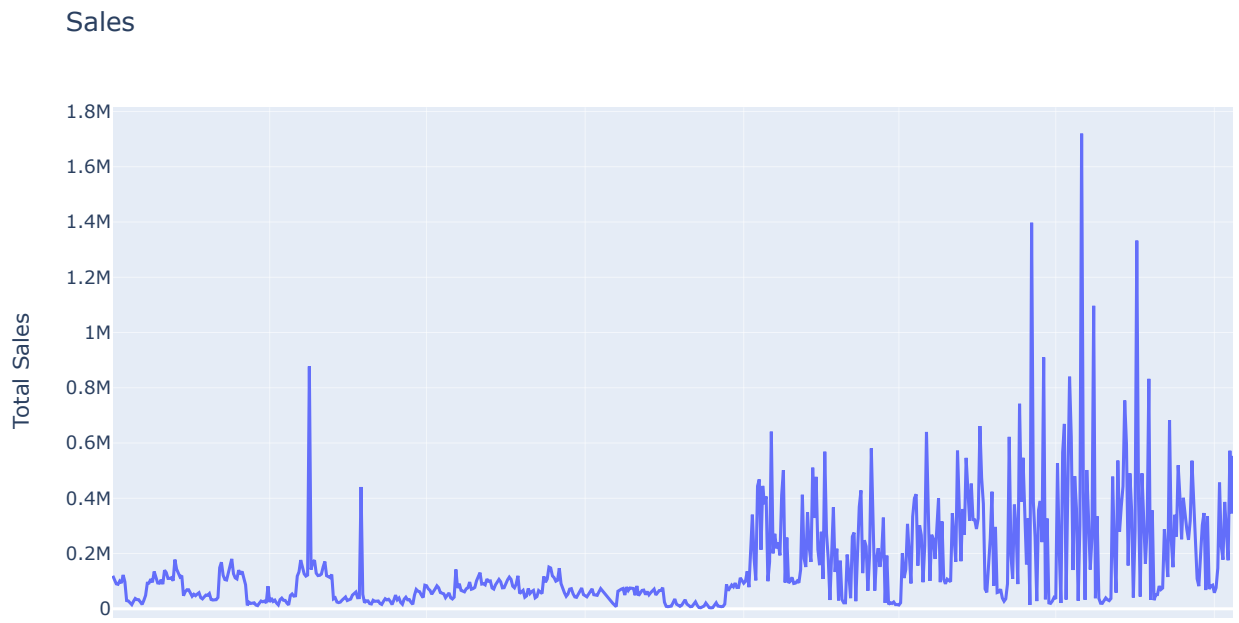
Out[65]:

	Invoice Date	Total Sales	Operating Profit
1	2020-01-01	119516.0	56444.34
2	2020-01-02	97660.0	34247.16
3	2020-01-03	90323.0	30716.01
4	2020-01-04	88580.0	34848.02
5	2020-01-05	100329.0	34066.56
...	...	...	...
720	2021-12-27	80353.0	40409.39
721	2021-12-28	40010.0	15009.10
722	2021-12-29	28859.0	12381.09
723	2021-12-30	22778.0	9123.03
724	2021-12-31	26534.0	9065.59

724 rows × 3 columns

In [66]:
```
1 fig = px.line(line, x="Invoice Date", y="Total Sales", title='Sales')
2 fig.show()
```

executed in 3.03s, finished 20:59:17 2024-06-26



In [67]:
```
1 px.bar( grossing_cities, y= 'City', x = 'Operating Profit')
```

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