

# sales-analysis

February 2, 2024

```
[2]: import pandas as pd
import os
```

mergin all the datas in a single file

```
[3]: df = pd.read_csv("E:\\PYTHON\\Sales_
↳Analysis\\Pandas-Data-Science-Tasks-master\\SalesAnalysis\\Sales_Data\\Sales_April_2019.
↳csv")

files = [file for file in os.listdir("E:\\PYTHON\\Sales_
↳Analysis\\Pandas-Data-Science-Tasks-master\\SalesAnalysis\\Sales_Data")]

all_months_data = pd.DataFrame()

for file in files:
    df = pd.read_csv("E:\\PYTHON\\Sales_
↳Analysis\\Pandas-Data-Science-Tasks-master\\SalesAnalysis\\Sales_Data\\"+file)
    all_months_data = pd.concat([all_months_data, df])

all_months_data.to_csv("all_data.csv", index=False)

[4]: all_data = pd.read_csv("all_data.csv")
all_data.head()
```

```
[4]:   Order ID      Product Quantity Ordered Price Each \
0   176558      USB-C Charging Cable           2      11.95
1   176559  Bose SoundSport Headphones           1     99.99
2   176560           Google Phone             1       600
3   176560      Wired Headphones              1     11.99
4   176561      Wired Headphones              1     11.99
```

```
      Order Date      Purchase Address
0   04/19/19 08:46   917 1st St, Dallas, TX 75001
1  04-07-2019 22:30   682 Chestnut St, Boston, MA 02215
2  04-12-2019 14:38  669 Spruce St, Los Angeles, CA 90001
3  04-12-2019 14:38  669 Spruce St, Los Angeles, CA 90001
4   04/30/19 09:27   333 8th St, Los Angeles, CA 90001
```

clean up the data drop rows with NAN

```
[5]: nan_df = all_data[all_data.isna().any(axis=1)]
nan_df.head()

all_data = all_data.dropna(how='all')
all_data.head()
```

```
[5]:   Order ID          Product Quantity Ordered Price Each \
0    176558      USB-C Charging Cable           2      11.95
1    176559  Bose SoundSport Headphones           1      99.99
2    176560          Google Phone             1       600
3    176560      Wired Headphones             1      11.99
4    176561      Wired Headphones             1      11.99

      Order Date          Purchase Address
0    04/19/19 08:46      917 1st St, Dallas, TX 75001
1    04-07-2019 22:30    682 Chestnut St, Boston, MA 02215
2    04-12-2019 14:38  669 Spruce St, Los Angeles, CA 90001
3    04-12-2019 14:38  669 Spruce St, Los Angeles, CA 90001
4     04/30/19 09:27    333 8th St, Los Angeles, CA 90001
```

find 'or' and delete it

```
[6]: all_data = all_data[all_data['Order Date'].str[0:2] != 'Or']
```

convert columns to the correct type

```
[7]: all_data['Quantity Ordered'] = pd.to_numeric(all_data['Quantity Ordered'])
      ↪ #Make int
all_data['Price Each'] = pd.to_numeric(all_data['Price Each']) #Make float
```

augment data with additional columns Add a month column

```
[8]: all_data['Month'] = all_data['Order Date'].str[0:2]
all_data['Month'] = all_data['Month'].astype('int32')

all_data.head()
```

```
[8]:   Order ID          Product Quantity Ordered Price Each \
0    176558      USB-C Charging Cable           2      11.95
1    176559  Bose SoundSport Headphones           1      99.99
2    176560          Google Phone             1     600.00
3    176560      Wired Headphones             1      11.99
4    176561      Wired Headphones             1      11.99

      Order Date          Purchase Address  Month
0    04/19/19 08:46      917 1st St, Dallas, TX 75001      4
```

|   |                  |                                      |   |
|---|------------------|--------------------------------------|---|
| 1 | 04-07-2019 22:30 | 682 Chestnut St, Boston, MA 02215    | 4 |
| 2 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4 |
| 3 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4 |
| 4 | 04/30/19 09:27   | 333 8th St, Los Angeles, CA 90001    | 4 |

Add a sales column

```
[9]: all_data['Sales'] = all_data['Quantity Ordered'] * all_data['Price Each']
all_data.head()
```

```
[9]:
```

|   | Order ID | Product                    | Quantity Ordered | Price Each | \ |
|---|----------|----------------------------|------------------|------------|---|
| 0 | 176558   | USB-C Charging Cable       | 2                | 11.95      |   |
| 1 | 176559   | Bose SoundSport Headphones | 1                | 99.99      |   |
| 2 | 176560   | Google Phone               | 1                | 600.00     |   |
| 3 | 176560   | Wired Headphones           | 1                | 11.99      |   |
| 4 | 176561   | Wired Headphones           | 1                | 11.99      |   |

|   | Order Date       | Purchase Address                     | Month | Sales  |
|---|------------------|--------------------------------------|-------|--------|
| 0 | 04/19/19 08:46   | 917 1st St, Dallas, TX 75001         | 4     | 23.90  |
| 1 | 04-07-2019 22:30 | 682 Chestnut St, Boston, MA 02215    | 4     | 99.99  |
| 2 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4     | 600.00 |
| 3 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4     | 11.99  |
| 4 | 04/30/19 09:27   | 333 8th St, Los Angeles, CA 90001    | 4     | 11.99  |

Add a city column

```
[10]: #using apply in this code
def get_city(address):
    return address.split(',')[1]

def get_state(address):
    return address.split(',')[2].split(' ')[1]

all_data['City'] = all_data['Purchase Address'].apply(lambda x: f"{get_city(x)}_{get_state(x)}")

all_data.head()
```

```
[10]:
```

|   | Order ID | Product                    | Quantity Ordered | Price Each | \ |
|---|----------|----------------------------|------------------|------------|---|
| 0 | 176558   | USB-C Charging Cable       | 2                | 11.95      |   |
| 1 | 176559   | Bose SoundSport Headphones | 1                | 99.99      |   |
| 2 | 176560   | Google Phone               | 1                | 600.00     |   |
| 3 | 176560   | Wired Headphones           | 1                | 11.99      |   |
| 4 | 176561   | Wired Headphones           | 1                | 11.99      |   |

|   | Order Date       | Purchase Address                  | Month | Sales | \ |
|---|------------------|-----------------------------------|-------|-------|---|
| 0 | 04/19/19 08:46   | 917 1st St, Dallas, TX 75001      | 4     | 23.90 |   |
| 1 | 04-07-2019 22:30 | 682 Chestnut St, Boston, MA 02215 | 4     | 99.99 |   |

|   |                  |                                      |   |        |
|---|------------------|--------------------------------------|---|--------|
| 2 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4 | 600.00 |
| 3 | 04-12-2019 14:38 | 669 Spruce St, Los Angeles, CA 90001 | 4 | 11.99  |
| 4 | 04/30/19 09:27   | 333 8th St, Los Angeles, CA 90001    | 4 | 11.99  |

|   | City             |
|---|------------------|
| 0 | Dallas (TX)      |
| 1 | Boston (MA)      |
| 2 | Los Angeles (CA) |
| 3 | Los Angeles (CA) |
| 4 | Los Angeles (CA) |

**Best month for sales and how much earned that month?**

```
[11]: results = all_data.groupby('Month').sum()
      results.head()
```

```
[11]:
```

|       | Order ID \  |
|-------|---|
| Month |   |
| 1     | 2971502978172978172979692983442990492991253003... |
| 2     | 1505021505031505041505051505061505071505081505... |
| 3     | 1505331505411508121517491520361532841535441538... |
| 4     | 1765581765591765601765601765611765621765631765... |
| 5     | 1769781775511777781777781790761790761791341800... |

|       | Product   | Quantity Ordered \ |
|-------|---|--------------------|
| Month |   |                    |
| 1     | Lightning Charging CableiPhoneLightning Chargi... | 10903              |
| 2     | iPhoneAA Batteries (4-pack)27in 4K Gaming Moni... | 13449              |
| 3     | AAA Batteries (4-pack)AAA Batteries (4-pack)Wi... | 17005              |
| 4     | USB-C Charging CableBose SoundSport Headphones... | 20558              |
| 5     | Apple AirPods Headphones27in FHD MonitoriPhone... | 18667              |

|       | Price Each | Order Date \                                      |
|-------|------------|---|
| Month |            |   |
| 1     | 1811768.38 | 01/01/20 00:3801/01/20 00:2201/01/20 00:2201/0... |
| 2     | 2188884.72 | 02/18/19 01:3502/13/19 07:2402/18/19 09:4602/0... |
| 3     | 2791207.83 | 03/01/19 03:0603/01/19 01:0303/01/19 02:1803/0... |
| 4     | 3367671.02 | 04/19/19 08:4604-07-2019 22:3004-12-2019 14:38... |
| 5     | 3135125.13 | 05-01-2019 03:2905-01-2019 00:1305-01-2019 00:... |

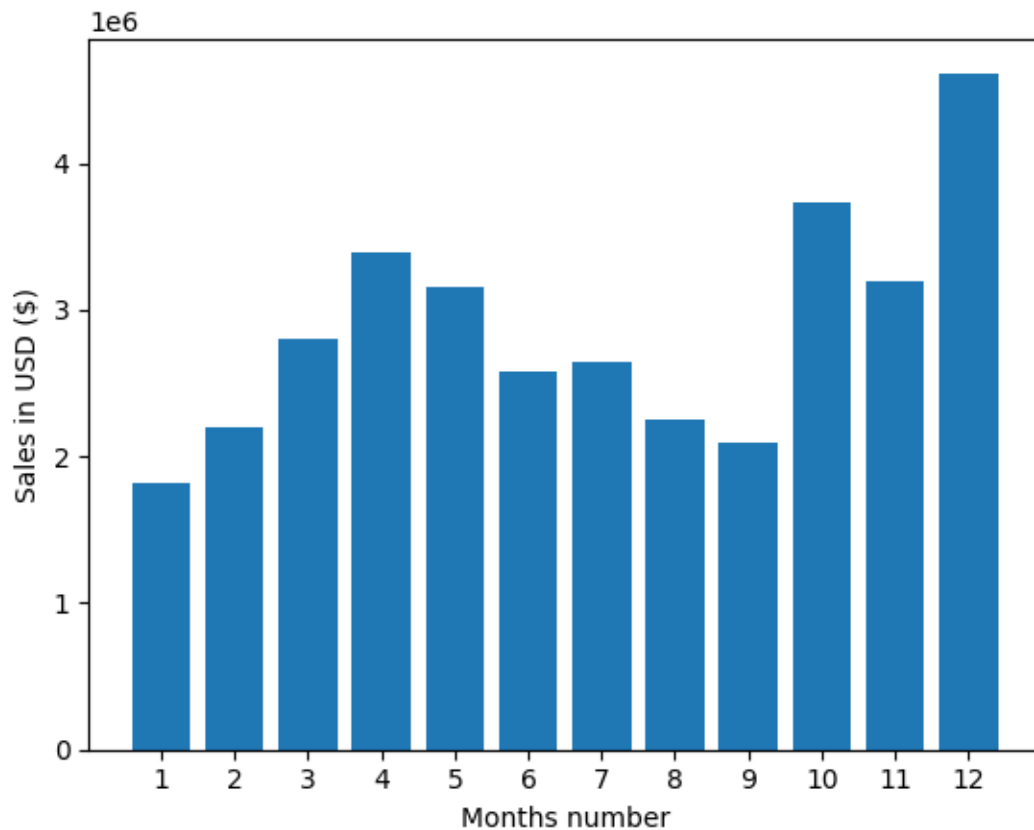
|       | Purchase Address                                  | Sales \    |
|-------|---|------------|
| Month |   |            |
| 1     | 427 Wilson St, Dallas, TX 75001519 13th St, Ne... | 1822256.73 |
| 2     | 866 Spruce St, Portland, ME 0410118 13th St, S... | 2202022.42 |
| 3     | 270 Dogwood St, San Francisco, CA 94016683 Ada... | 2807100.38 |
| 4     | 917 1st St, Dallas, TX 75001682 Chestnut St, B... | 3390670.24 |
| 5     | 589 Lake St, Portland, OR 97035615 Lincoln St,... | 3152606.75 |

|       | City   |
|-------|--|
| Month |  |
| 1     | Dallas (TX) New York City (NY) New York City ... |
| 2     | Portland (ME) San Francisco (CA) New York Cit... |
| 3     | San Francisco (CA) Portland (OR) San Francisc... |
| 4     | Dallas (TX) Boston (MA) Los Angeles (CA) Los ... |
| 5     | Portland (OR) San Francisco (CA) Boston (MA) ... |

```
[12]: import matplotlib.pyplot as plt
```

```
Months = range(1,13)

plt.bar(Months, results['Sales'])
plt.xticks(Months)
plt.ylabel('Sales in USD ($)')
plt.xlabel('Months number')
plt.show()
```



city with highest sales

```
[13]: results = all_data.groupby('City').sum()
      results
```

```
[13]:
```

|                    | Order ID \  |
|--------------------|---|
| City               |   |
| Atlanta (GA)       | 1765641765711765821765891766231766271766341766... |
| Austin (TX)        | 1765911766091766741766771766861767011767051767... |
| Boston (MA)        | 1765591765661765781765811765851765851766001766... |
| Dallas (TX)        | 1765581765691765701765771765961766021766101766... |
| Los Angeles (CA)   | 1765601765601765611765671765741765741765761765... |
| New York City (NY) | 1765721765751765791765901765991766131766371766... |
| Portland (ME)      | 1767731768791769091770721772301772331772991773... |
| Portland (OR)      | 1765831765931766171766421766461766481766621767... |
| San Francisco (CA) | 1765621765651765731765841765861765861765941765... |
| Seattle (WA)       | 1765631765681765881766121766241766541766631766... |

|                    | Product \   |
|--------------------|---|
| City               |   |
| Atlanta (GA)       | USB-C Charging CableLightning Charging CableBo... |
| Austin (TX)        | Apple Airpods HeadphonesApple Airpods Headphon... |
| Boston (MA)        | Bose SoundSport HeadphonesWired HeadphonesAppl... |
| Dallas (TX)        | USB-C Charging Cable27in 4K Gaming MonitorAA B... |
| Los Angeles (CA)   | Google PhoneWired HeadphonesWired HeadphonesGo... |
| New York City (NY) | Apple Airpods HeadphonesAAA Batteries (4-pack)... |
| Portland (ME)      | AAA Batteries (4-pack)Flatscreen TVWired Headp... |
| Portland (OR)      | AAA Batteries (4-pack)Lightning Charging Cable... |
| San Francisco (CA) | USB-C Charging CableMacbook Pro LaptopUSB-C Ch... |
| Seattle (WA)       | Bose SoundSport HeadphonesLightning Charging C... |

|                    | Quantity Ordered | Price Each \ |
|--------------------|------------------|--------------|
| City               |                  |              |
| Atlanta (GA)       | 16602            | 2779908.20   |
| Austin (TX)        | 11153            | 1809873.61   |
| Boston (MA)        | 22528            | 3637409.77   |
| Dallas (TX)        | 16730            | 2752627.82   |
| Los Angeles (CA)   | 33289            | 5421435.23   |
| New York City (NY) | 27932            | 4635370.83   |
| Portland (ME)      | 2750             | 447189.25    |
| Portland (OR)      | 11303            | 1860558.22   |
| San Francisco (CA) | 50239            | 8211461.74   |
| Seattle (WA)       | 16553            | 2733296.01   |

|              | Order Date \                                      |
|--------------|---|
| City         |   |
| Atlanta (GA) | 04-12-2019 10:5804/19/19 14:2904/27/19 12:2004... |
| Austin (TX)  | 04/21/19 07:2104-11-2019 16:5904/20/19 20:5304... |
| Boston (MA)  | 04-07-2019 22:3004-08-2019 14:0504-09-2019 23:... |

|                    |   |
|--------------------|---|
| Dallas (TX)        | 04/19/19 08:4604/16/19 19:2304/22/19 15:0904-0... |
| Los Angeles (CA)   | 04-12-2019 14:3804-12-2019 14:3804/30/19 09:27... |
| New York City (NY) | 04-04-2019 20:3004/27/19 00:3004-11-2019 10:23... |
| Portland (ME)      | 04/25/19 20:0704/13/19 14:1504/22/19 09:5304-0... |
| Portland (OR)      | 04/20/19 12:0004/15/19 13:4504/25/19 08:0304/1... |
| San Francisco (CA) | 04/29/19 13:0304/24/19 10:3804/27/19 18:4104/2... |
| Seattle (WA)       | 04-02-2019 07:4604/15/19 12:1804-02-2019 04:00... |

Purchase Address \

City

|                    |   |
|--------------------|---|
| Atlanta (GA)       | 790 Ridge St, Atlanta, GA 30301253 Johnson St,... |
| Austin (TX)        | 600 Maple St, Austin, TX 73301267 11th St, Aus... |
| Boston (MA)        | 682 Chestnut St, Boston, MA 0221583 7th St, Bo... |
| Dallas (TX)        | 917 1st St, Dallas, TX 75001657 Hill St, Dalla... |
| Los Angeles (CA)   | 669 Spruce St, Los Angeles, CA 90001669 Spruce... |
| New York City (NY) | 149 Dogwood St, New York City, NY 10001433 Hil... |
| Portland (ME)      | 30 9th St, Portland, ME 04101370 Sunset St, Po... |
| Portland (OR)      | 146 Jackson St, Portland, OR 97035906 7th St, ... |
| San Francisco (CA) | 381 Wilson St, San Francisco, CA 94016915 Will... |
| Seattle (WA)       | 668 Center St, Seattle, WA 98101438 Elm St, Se... |

|  | Month | Sales |
|--|-------|-------|
|--|-------|-------|

City

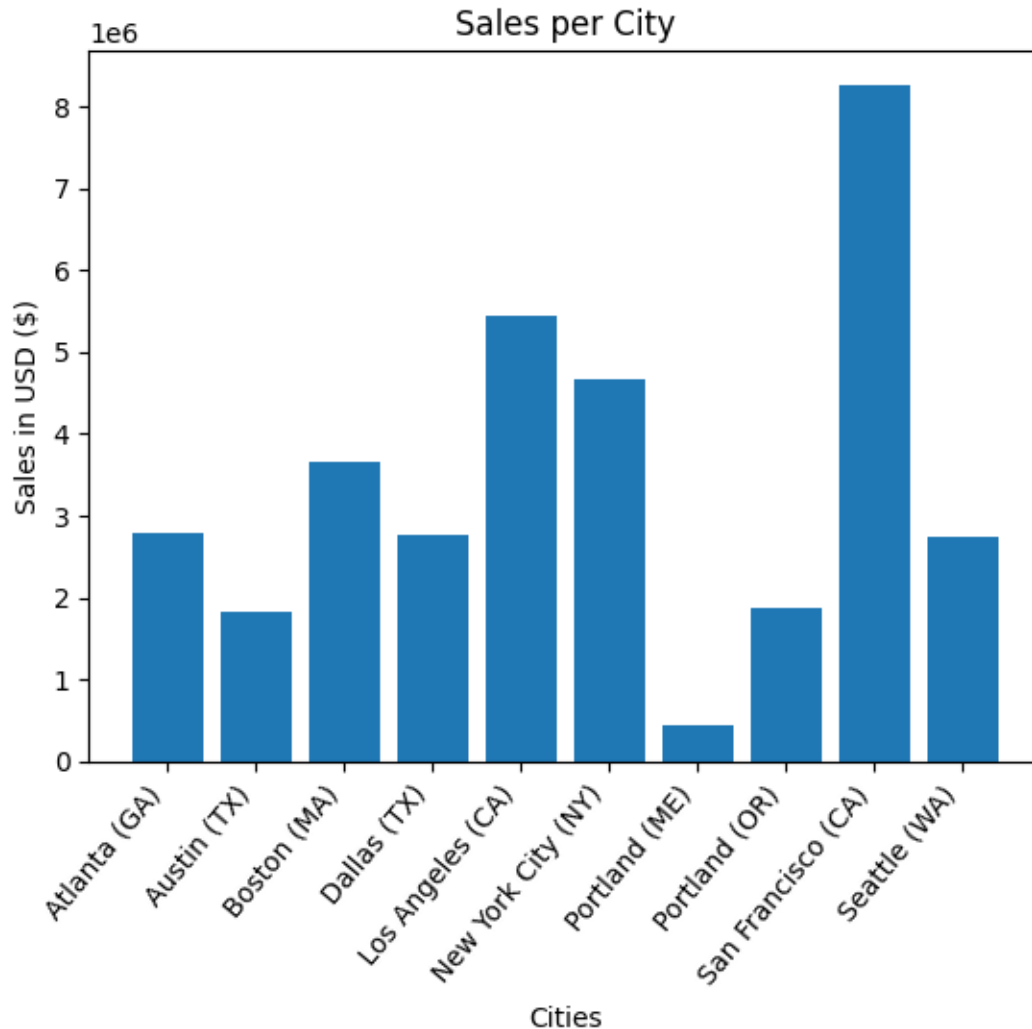
|                    |        |            |
|--------------------|--------|------------|
| Atlanta (GA)       | 104794 | 2795498.58 |
| Austin (TX)        | 69829  | 1819581.75 |
| Boston (MA)        | 141112 | 3661642.01 |
| Dallas (TX)        | 104620 | 2767975.40 |
| Los Angeles (CA)   | 208325 | 5452570.80 |
| New York City (NY) | 175741 | 4664317.43 |
| Portland (ME)      | 17144  | 449758.27  |
| Portland (OR)      | 70621  | 1870732.34 |
| San Francisco (CA) | 315520 | 8262203.91 |
| Seattle (WA)       | 104941 | 2747755.48 |

```
[14]: import matplotlib.pyplot as plt

Cities = [city for city, df in all_data.groupby('City')]

plt.bar(Cities, results['Sales'])
plt.xticks(rotation=50, ha='right') # Rotate x-axis labels for better
    ↪readability
plt.ylabel('Sales in USD ($)')
plt.xlabel('Cities')
plt.title('Sales per City')

plt.show()
```



Time should we display advertisements to maximize likelihood of customers buying product

```
[15]: all_data['Order Date'] = pd.to_datetime(all_data['Order Date'])
```

C:\Users\Admin\AppData\Local\Temp\ipykernel\_13952\3800722887.py:1: UserWarning: Could not infer format, so each element will be parsed individually, falling back to `dateutil`. To ensure parsing is consistent and as-expected, please specify a format.

```
all_data['Order Date'] = pd.to_datetime(all_data['Order Date'])
```

```
[18]: all_data['Hour'] = all_data['Order Date'].dt.hour
all_data['Minute'] = all_data['Order Date'].dt.minute

all_data.head()
```



```
[18]:
```

|   | Order ID | Product                    | Quantity Ordered | Price Each | \ |
|---|----------|----------------------------|------------------|------------|---|
| 0 | 176558   | USB-C Charging Cable       | 2                | 11.95      |   |
| 1 | 176559   | Bose SoundSport Headphones | 1                | 99.99      |   |
| 2 | 176560   | Google Phone               | 1                | 600.00     |   |
| 3 | 176560   | Wired Headphones           | 1                | 11.99      |   |
| 4 | 176561   | Wired Headphones           | 1                | 11.99      |   |

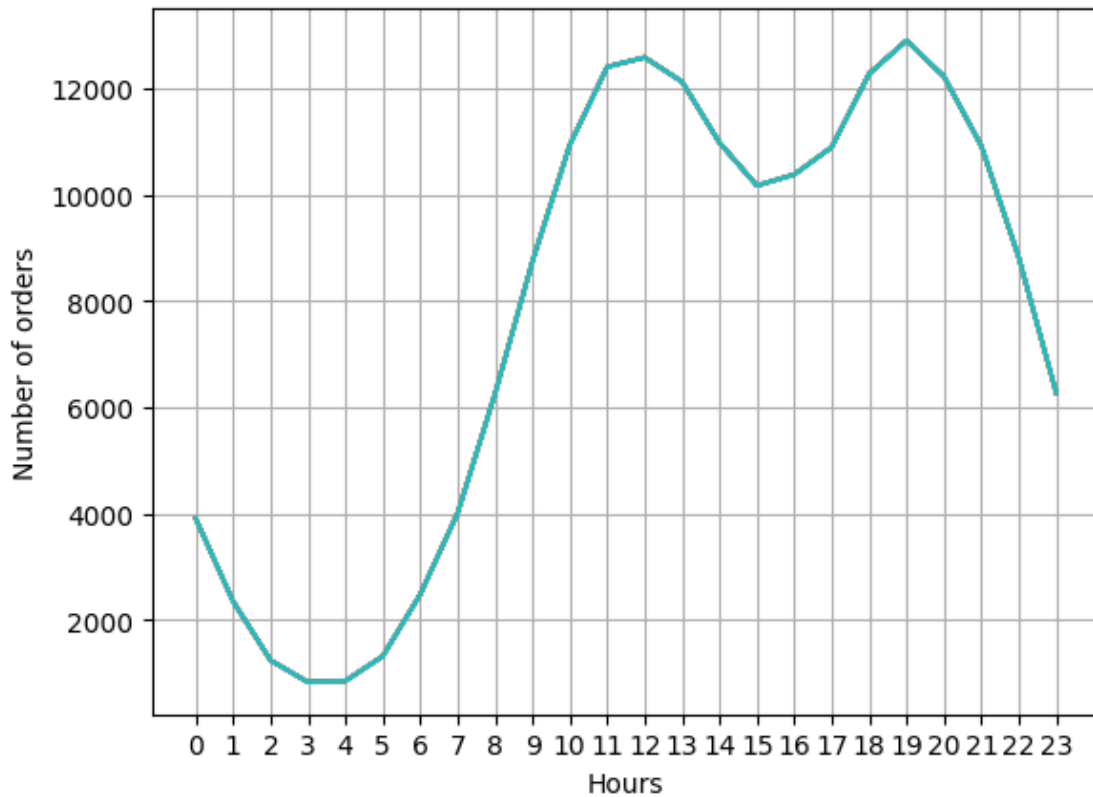
|   | Order Date          | Purchase Address                     | Month | Sales  | \ |
|---|---------------------|--------------------------------------|-------|--------|---|
| 0 | 2019-04-19 08:46:00 | 917 1st St, Dallas, TX 75001         | 4     | 23.90  |   |
| 1 | 2019-04-07 22:30:00 | 682 Chestnut St, Boston, MA 02215    | 4     | 99.99  |   |
| 2 | 2019-04-12 14:38:00 | 669 Spruce St, Los Angeles, CA 90001 | 4     | 600.00 |   |
| 3 | 2019-04-12 14:38:00 | 669 Spruce St, Los Angeles, CA 90001 | 4     | 11.99  |   |
| 4 | 2019-04-30 09:27:00 | 333 8th St, Los Angeles, CA 90001    | 4     | 11.99  |   |

|   | City             | Hour | Minute |
|---|------------------|------|--------|
| 0 | Dallas (TX)      | 8    | 46     |
| 1 | Boston (MA)      | 22   | 30     |
| 2 | Los Angeles (CA) | 14   | 38     |
| 3 | Los Angeles (CA) | 14   | 38     |
| 4 | Los Angeles (CA) | 9    | 27     |

```
[26]: hours = [hour for hour, df in all_data.groupby('Hour')]

plt.plot(hours, all_data.groupby(['Hour']).count())
plt.xticks(hours)
plt.grid()
plt.xlabel('Hours')
plt.ylabel('Number of orders')
plt.show()
```



### Products most often sold together

```
[33]: df = all_data[all_data['Order ID'].duplicated(keep=False)]
df['Grouped'] = df.groupby('Order ID')['Product'].transform(lambda x: ','.join(x))
df = df[['Order ID', 'Grouped']].drop_duplicates()
df.head()
```

C:\Users\Admin\AppData\Local\Temp\ipykernel\_13952\868064316.py:2:

SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.

Try using `.loc[row_indexer,col_indexer] = value` instead

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

```
df['Grouped'] = df.groupby('Order ID')['Product'].transform(lambda x:
','.join(x))
```

```
[33]:   Order ID   Grouped
      2  176560   Google Phone,Wired Headphones
     17  176574   Google Phone,USB-C Charging Cable
     29  176585  Bose SoundSport Headphones,Bose SoundSport Hea...
```

```

31      176586                AAA Batteries (4-pack),Google Phone
118     176672      Lightning Charging Cable,USB-C Charging Cable

```

```

[35]: from itertools import combinations
      from collections import Counter

      count = Counter()

      for row in df['Grouped']:
          row_list = row.split(',')
          count.update(Counter(combinations(row_list, 2)))

      for key, value in count.most_common(10):
          print(key, value)

```

```

('iPhone', 'Lightning Charging Cable') 1005
('Google Phone', 'USB-C Charging Cable') 987
('iPhone', 'Wired Headphones') 447
('Google Phone', 'Wired Headphones') 414
('Vareebadd Phone', 'USB-C Charging Cable') 361
('iPhone', 'Apple AirPods Headphones') 360
('Google Phone', 'Bose SoundSport Headphones') 220
('USB-C Charging Cable', 'Wired Headphones') 160
('Vareebadd Phone', 'Wired Headphones') 143
('Lightning Charging Cable', 'Wired Headphones') 92

```

#### product sold most and why its sold most

```

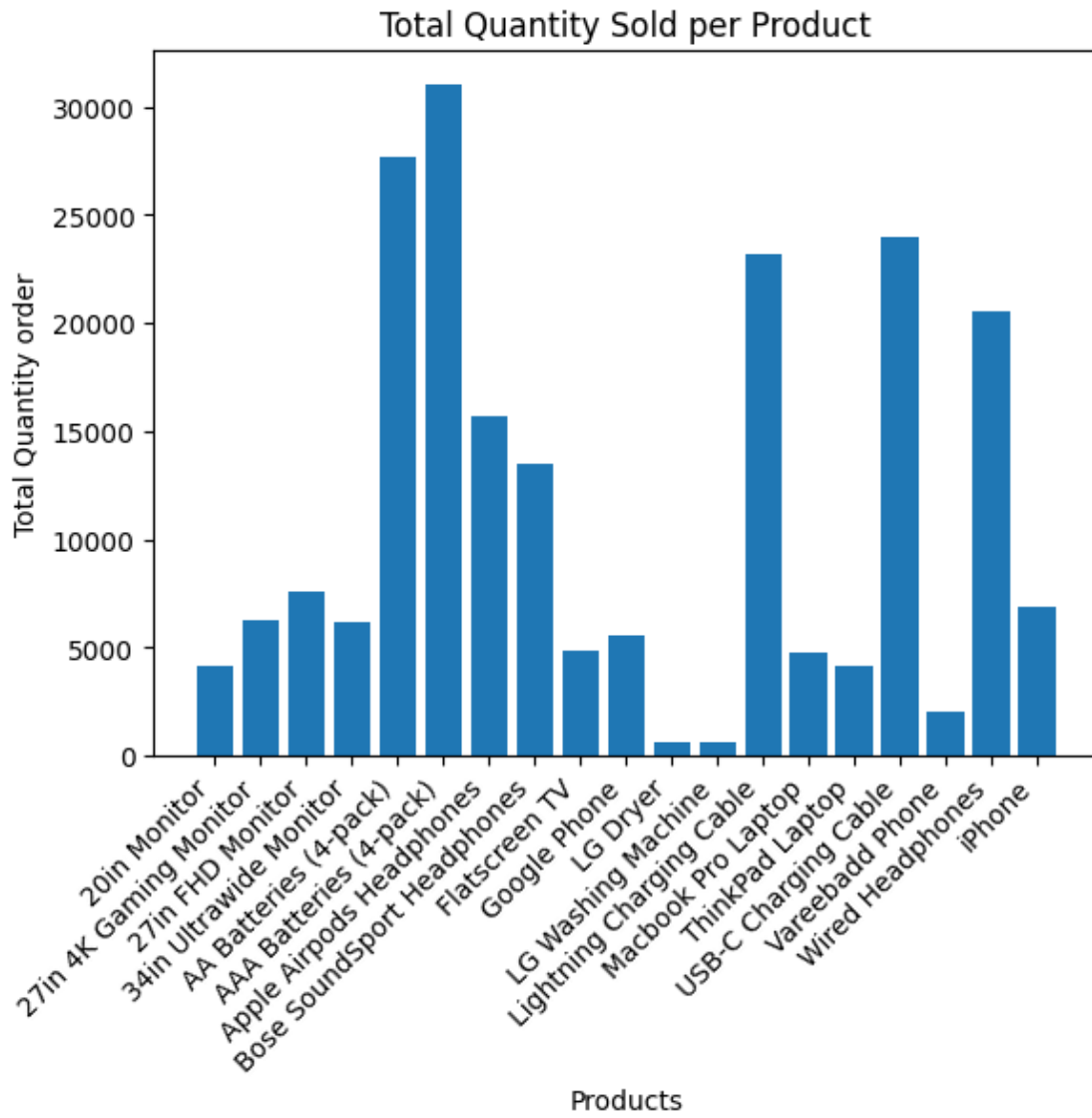
[56]: # Assuming 'all_data' is a DataFrame with 'Quantity' and 'Order Date' columns
      all_data['Order Date'] = pd.to_datetime(all_data['Order Date']) # Convert to_
      ↪datetime if not already

      # Group by 'Product' and sum the 'Quantity' column
      product_group = all_data.groupby('Product').agg({'Quantity Ordered': 'sum'})

      # Resetting the index to make 'Product' a regular column
      product_group = product_group.reset_index()

      # Plotting
      plt.bar(product_group['Product'], product_group['Quantity Ordered'])
      plt.xticks(rotation=45, ha='right')
      plt.ylabel('Total Quantity order')
      plt.xlabel('Products')
      plt.title('Total Quantity Sold per Product')
      plt.show()

```



```
[72]: Price = all_data.groupby('Product').agg({'Price Each': 'count'})
      print(Price)
```

| Product                    | Price Each |
|----------------------------|------------|
| 20in Monitor               | 4101       |
| 27in 4K Gaming Monitor     | 6230       |
| 27in FHD Monitor           | 7507       |
| 34in Ultrawide Monitor     | 6181       |
| AA Batteries (4-pack)      | 20577      |
| AAA Batteries (4-pack)     | 20641      |
| Apple Airpods Headphones   | 15549      |
| Bose SoundSport Headphones | 13325      |

|                          |       |
|--------------------------|-------|
| Flatscreen TV            | 4800  |
| Google Phone             | 5525  |
| LG Dryer                 | 646   |
| LG Washing Machine       | 666   |
| Lightning Charging Cable | 21658 |
| Macbook Pro Laptop       | 4724  |
| ThinkPad Laptop          | 4128  |
| USB-C Charging Cable     | 21903 |
| Vareebadd Phone          | 2065  |
| Wired Headphones         | 18882 |
| iPhone                   | 6842  |

```
[ ]: # Price = all_data.groupby('Product').agg({'Price Each': 'count'})

# fig, ax1 = plt.subplots()

# ax2 = ax1.twinx()
# ax1.bar(product_group['Product'], product_group['Quantity Ordered'])
# ax2.plot(product_group, Price, 'b-')

# ax1.set_xlabel('product_group')
# ax1.set_ylabel('Quantity Ordered', color='b')
# ax2.set_ylabel('Price ($)', color='g')
# ax1.set_xticklabels(product_group, rotation='vertical', size=8)

# plt.show()
```

```
[79]: import matplotlib.pyplot as plt

# Assuming 'Price Each' is the column you want to count for each product
quantity_ordered = all_data.groupby('Product')['Quantity Ordered'].sum()
average_price = all_data.groupby('Product')['Price Each'].mean()

fig, ax1 = plt.subplots()

ax2 = ax1.twinx()
ax1.bar(quantity_ordered.index, quantity_ordered, color='g', alpha=0.7,
        label='Quantity Ordered')
ax2.plot(average_price.index, Price['Price Each'], 'b-', label='Average Price')
        # Provide the x-values and y-values

ax1.set_xlabel('Product')
ax1.set_ylabel('Quantity Ordered', color='g')
ax2.set_ylabel('Average Price ($)', color='b')
ax1.set_xticklabels(quantity_ordered.index, rotation='vertical', size=8)

# Combine legends from both axes
```

```

lines, labels = ax1.get_legend_handles_labels()
lines2, labels2 = ax2.get_legend_handles_labels()
ax2.legend(lines + lines2, labels + labels2, loc='upper left')

plt.show()

```

C:\Users\Admin\AppData\Local\Temp\ipykernel\_13952\558073947.py:16: UserWarning: set\_ticklabels() should only be used with a fixed number of ticks, i.e. after set\_ticks() or using a FixedLocator.

```
ax1.set_xticklabels(quantity_ordered.index, rotation='vertical', size=8)
```

