SALE ANALYSIS REPORT

1. Data Overview

The original dataset contains sales in 12 months in 2019, include 186850 rows and 6 columns

There are 6 attributes, including:

- Order ID: index of order
- Product: name of product
- Quantity Ordered: number of items of order
- Price Each: price of each each item of order
- Order Date: date of ordering
- Purchase Address: address of ordering

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001

First 5 rows and several columns of dataset

2. Data Validation

Before jumping to the analysis process, we should do data pre-processing, including cleaning and transformation steps. The first thing I did was merge 12 months of sales data into a single CSV file. I also remove blank rows that had no data recorded and rows that have column Order Data containing string objects not datetime objects. And finally, converting the data type of some columns to the correct type.

3. Descriptive Analysis

### 3.1. What was the best month for sales? How much was earned that month?

Below is the number of sales in 12 months in 2019. We can observe an upward trend in total sales by month. To be more detailed, the figure was pretty low in the first quarter, then increased gradually although it declined in the third quarter and peaked in the fourth quarter. December was the month that has the highest sales in the entire year

that has over 4,5 million dollars in sales. **It means customers' ordering habits increased at the end of year, so that we should launch appropriate plans to boost this metric.**
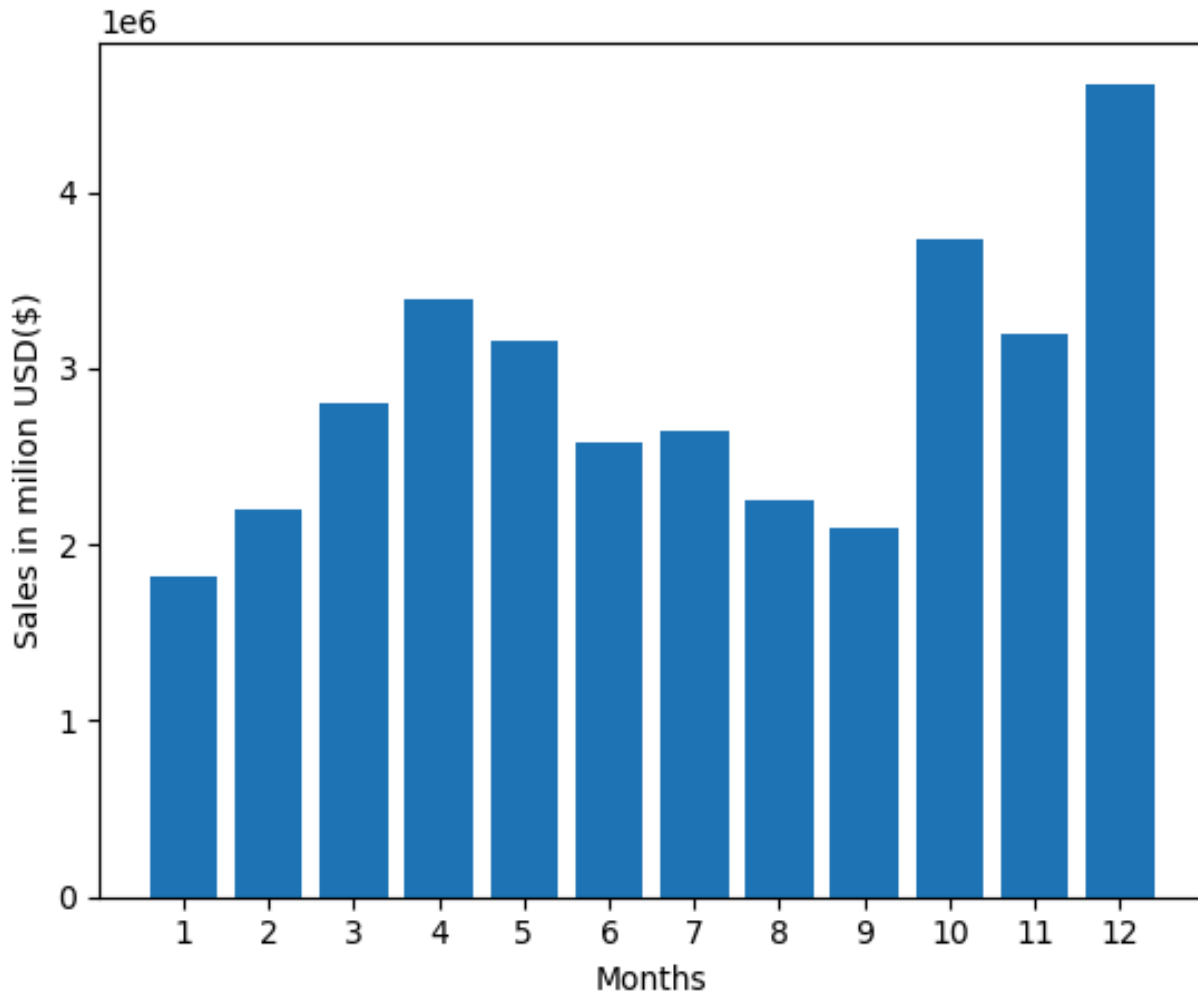

3.2 What city sold the most products?

The diagram shows that San Francisco, CA had the highest sales, which values more than 8 million dollars in sales. Los Angeles, CA and New York City, NY were in second and third place with over 5,5 and 4,5 millions dollars respectively. Portland, ME has the smallest number of sales, which are approximately 0.5 millions . **This indicates that shopping activities were highly frequent in large cities of large states, particularly New York and California.**
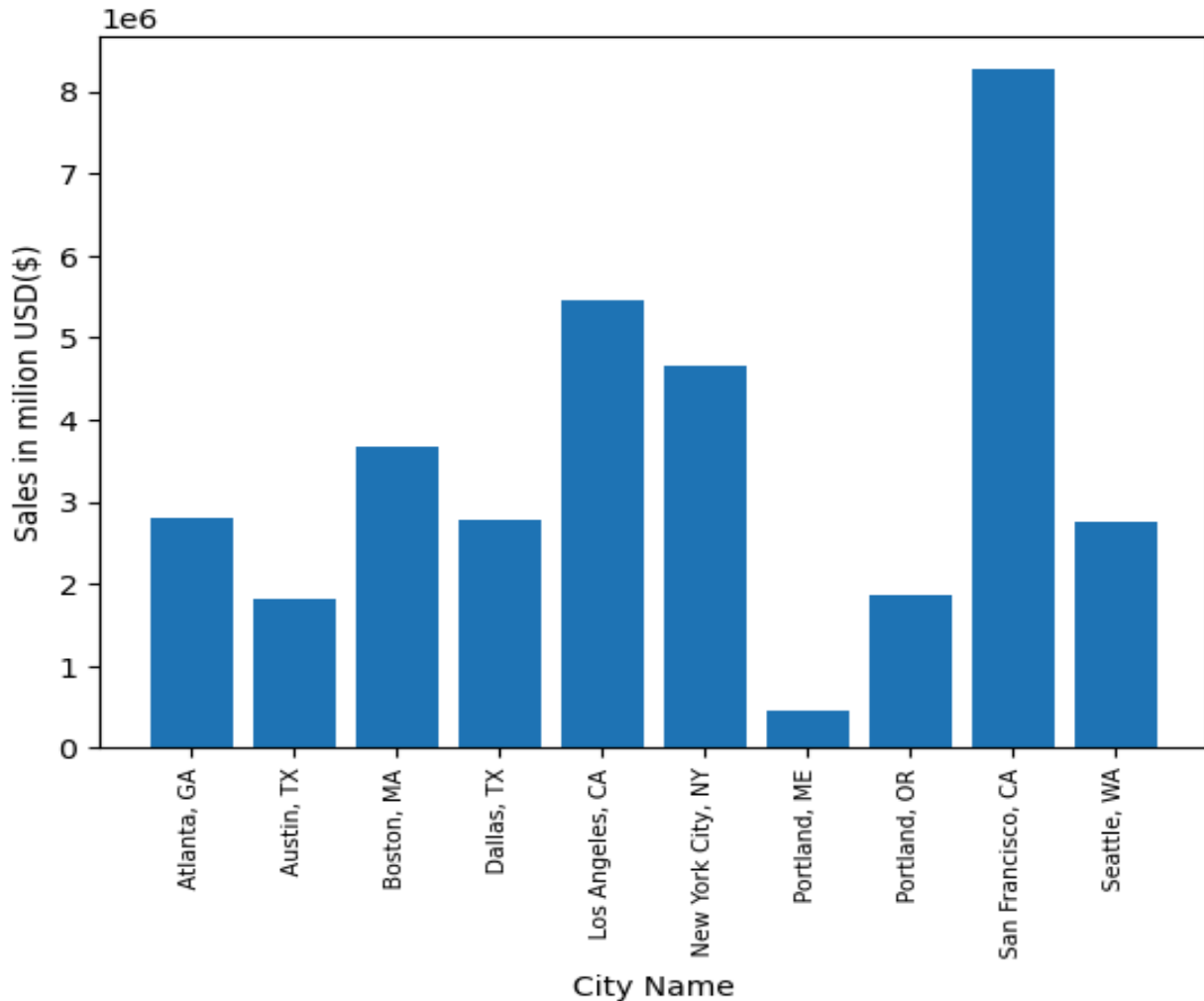
3.3. What time should we display advertisements to maximize the likelihood of customer's buying a product?

It can be seen from the line chart above that the sales had an upward trend in the middle of the day. On particular days, the sales of the first seven hours tend to be less than that of the next twelve hours. During the middle of day, such figures increased dramatically in twelve and nineteen hour o'clock then significantly declined in twenty hour o'clock. **This would suggest that customers had a tendency to spend more in the middle of the day and after dinner time, while shopping activities in the first seven hour of day and in the night were less frequent.**
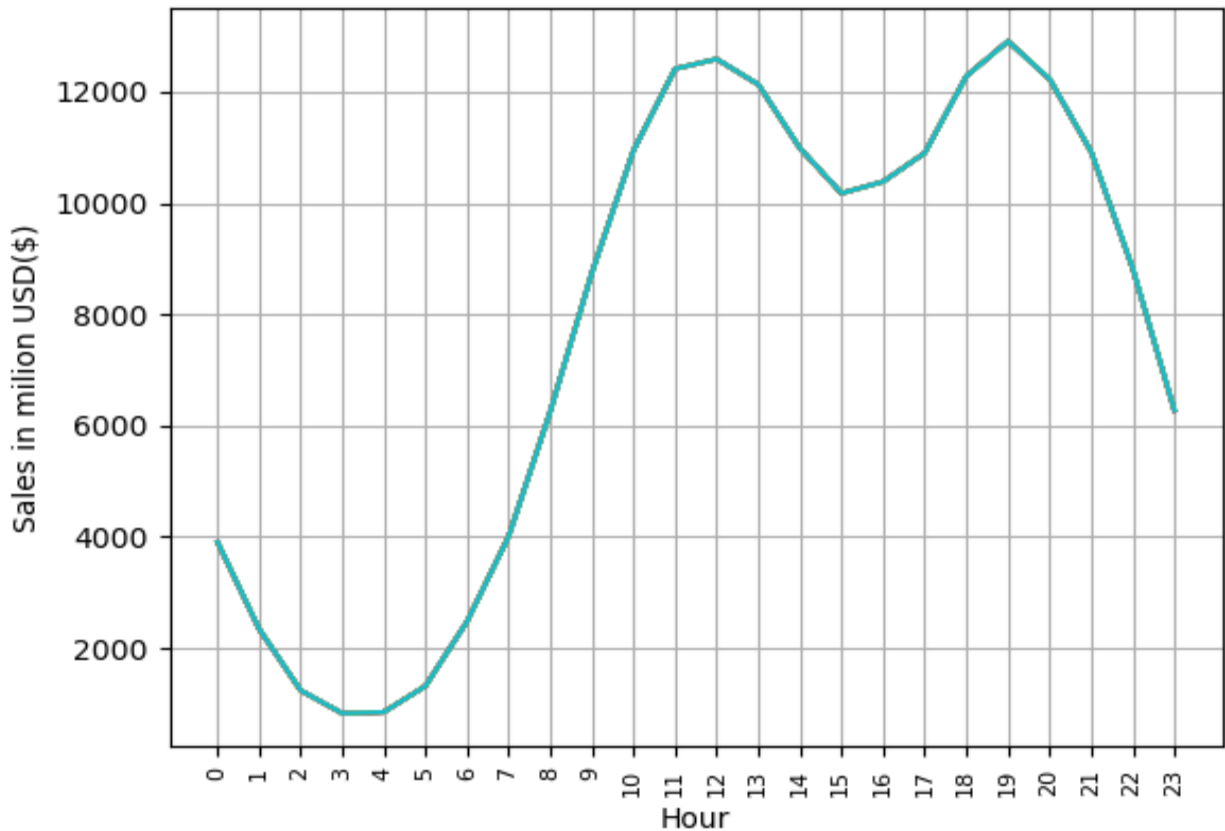
### 3.4 What products are most often sold together?

```
('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
```

In this number of results, We can see that customers who buy iPhones often purchase Lightning Charging Cables and Wired Headphones because these are essential accessories for iPhone users. Meanwhile, Wired Headphones are frequently bought with various phone and cable types. This suggests that Wired Headphones are a popular general accessory for many phone users. **We should promote bundles that include a phone with its corresponding charging cable and headphones. This would be a**

convenient option for customers who are looking to purchase all of these items at once. Beside that, offering discounts or promotions for products that are frequently bought together. This could encourage customers to purchase additional items.

3.5. What product sold the most? Why do you think it sold the most?
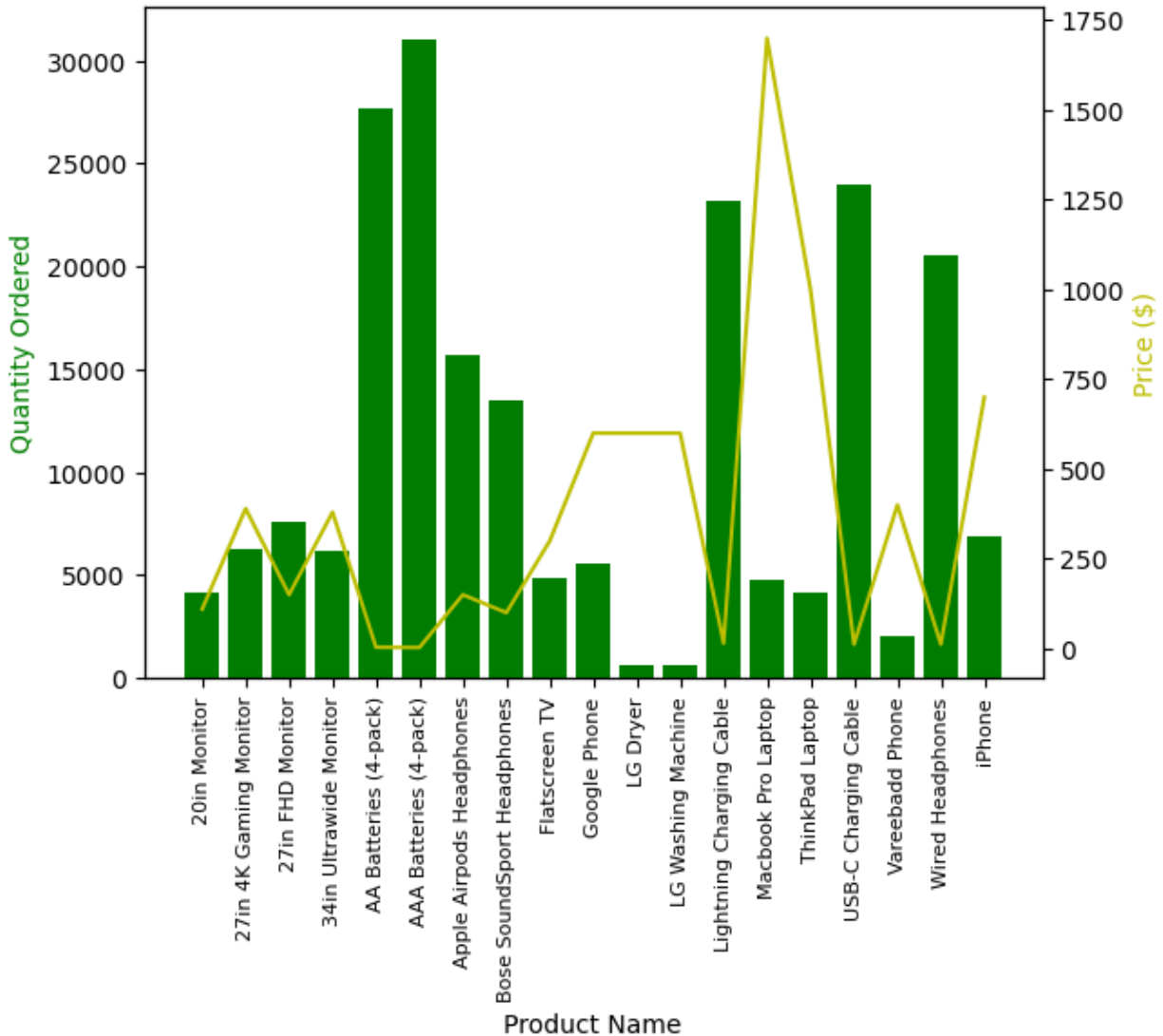
Based on the chart, the product that sold the most is AAA Batteries (4-pack). Beside that there are more products that are bought at a high number such as AA Batteries, Lighting Changing Cable, USB-C Charging Cable and Wired Headphones. The reason for these products having a high number of sales is the price. The prices of these products are pretty low compared to other products. **We suggest increasing the number of the products that have low prices to promote the sales.**