store-sales-profit-analysis

December 6, 2023

** Store Sales and Profit Analysis using Python **

[ ]:
```
# Now let's start this task by importing necessary libraies:

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go
import plotly.io as pio
import plotly.colors as colors
pio.templates.default = 'plotly_white'
```

[ ]:
```
data = pd.read_csv('Sample - Superstore.csv',encoding = 'latin1')
data.head()
```

[ ]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	…
0	1	CA-2016-152156	11/8/2016	11/11/2016	Second Class	CG-12520	
1	2	CA-2016-152156	11/8/2016	11/11/2016	Second Class	CG-12520	
2	3	CA-2016-138688	6/12/2016	6/16/2016	Second Class	DV-13045	
3	4	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	
4	5	US-2015-108966	10/11/2015	10/18/2015	Standard Class	SO-20335	

	Customer Name	Segment	Country	City	…
0	Claire Gute	Consumer	United States	Henderson	…
1	Claire Gute	Consumer	United States	Henderson	…
2	Darrin Van Huff	Corporate	United States	Los Angeles	…
3	Sean O'Donnell	Consumer	United States	Fort Lauderdale	…
4	Sean O'Donnell	Consumer	United States	Fort Lauderdale	…

	Postal Code	Region	Product ID	Category	Sub-Category
0	42420	South	FUR-BO-10001798	Furniture	Bookcases
1	42420	South	FUR-CH-10000454	Furniture	Chairs
2	90036	West	OFF-LA-10000240	Office Supplies	Labels
3	33311	South	FUR-TA-10000577	Furniture	Tables
4	33311	South	OFF-ST-10000760	Office Supplies	Storage

```
                                        Product Name     Sales  Quantity  \
0                    Bush Somerset Collection Bookcase  261.9600         2
1  Hon Deluxe Fabric Upholstered Stacking Chairs,…  731.9400         3
2  Self-Adhesive Address Labels for Typewriters b…   14.6200         2
3      Bretford CR4500 Series Slim Rectangular Table  957.5775         5
4                       Eldon Fold 'N Roll Cart System   22.3680         2

   Discount    Profit
0      0.00   41.9136
1      0.00  219.5820
2      0.00    6.8714
3      0.45 -383.0310
4      0.20    2.5164

[5 rows x 21 columns]
```

[ ]:
```
data.columns
```

[ ]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'Country', 'City', 'State',
       'Postal Code', 'Region', 'Product ID', 'Category', 'Sub-Category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit'],
      dtype='object')
```

[ ]:
```
data.isnull().sum()
```

[ ]:
```
Row ID          0
Order ID        0
Order Date      0
Ship Date       0
Ship Mode       0
Customer ID     0
Customer Name   0
Segment         0
Country         0
City            0
State           0
Postal Code     0
Region          0
Product ID      0
Category        0
Sub-Category    0
Product Name    0
Sales           0
Quantity        0
Discount        0
Profit          0
```

```
dtype: int64
```

```
[ ]: # let's start by looking at the descriptive  statistics of the dataset
data.describe()
```

```
[ ]:             Row ID   Postal Code         Sales     Quantity     Discount  \
count  9994.000000   9994.000000   9994.000000  9994.000000  9994.000000
mean   4997.500000  55190.379428    229.858001     3.789574     0.156203
std    2885.163629  32063.693350    623.245101     2.225110     0.206452
min       1.000000   1040.000000      0.444000     1.000000     0.000000
25%    2499.250000  23223.000000     17.280000     2.000000     0.000000
50%    4997.500000  56430.500000     54.490000     3.000000     0.200000
75%    7495.750000  90008.000000    209.940000     5.000000     0.200000
max    9994.000000  99301.000000  22638.480000    14.000000     0.800000

              Profit
count  9994.000000
mean     28.656896
std     234.260108
min   -6599.978000
25%       1.728750
50%       8.666500
75%      29.364000
max    8399.976000
```

The dataset has an order date column. we can use this column to create new columns like order month, year and orderday, which will be very valuable for sales and profit analysis according to time periods.

```
[ ]: data['Order Date'].dtypes
```

```
[ ]: dtype('O')
```

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

```
[ ]: data['Order Date'].dtypes
```

```
[ ]: dtype('<M8[ns]')
```

```
[ ]: data['Ship Date'] = pd.to_datetime(data['Ship Date'])
```

```
[ ]: data['Order Month'] = data['Order Date'].dt.month
```

```
[ ]: data['Order Year'] = data['Order Date'].dt.year
```

```
[ ]: data['Order Day of Week']=data['Order Date'].dt.dayofweek
```

1 Now let's have a look at the monthly sales:

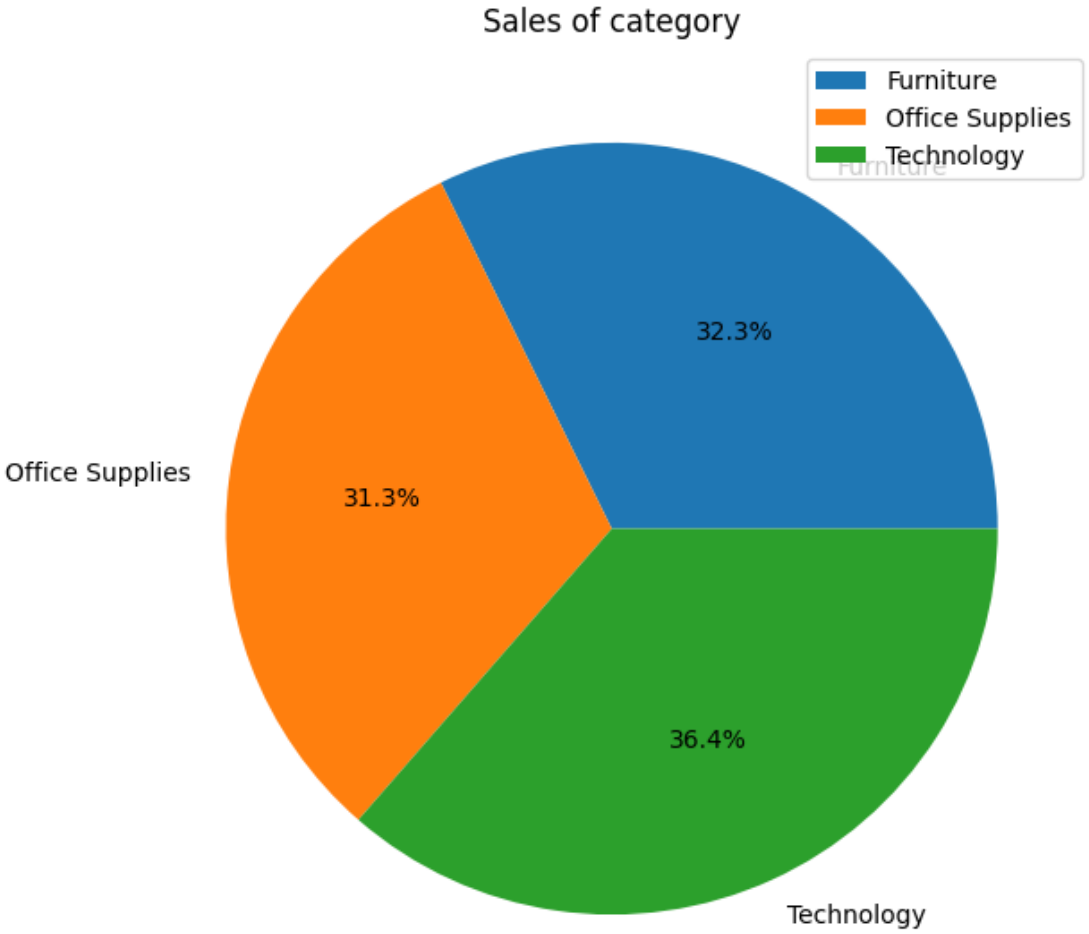
[ ]:
```
sales_by_month = data.groupby('Order Month')['Sales'].sum().reset_index()
# Plot the line chart
plt.plot(sales_by_month['Order Month'], sales_by_month['Sales'])
plt.xlabel('Order Month')
plt.ylabel('Sales')
plt.title('Sales by Month')
plt.show()
```

[ ]:
```
data['Category'].value_counts()
```

[ ]:
```
Office Supplies    6026
Furniture          2121
Technology         1847
Name: Category, dtype: int64
```

[ ]:
```
# now let's have a look at the sales by category:
sales_by_category = data.groupby('Category')['Sales'].sum().reset_index()
labels = sales_by_category['Category']
```

```
sizes = sales_by_category['Sales']
plt.figure(figsize=(10,7))
plt.pie(sizes, labels = labels,autopct='%1.1f%%')
plt.title('Sales of category')
plt.legend()
plt.show()
```



[ ]:
```
data['Sub-Category'].value_counts()
```

[ ]:
```
Binders        1523
Paper          1370
Furnishings     957
Phones          889
Storage         846
Art             796
```

```
Accessories     775
Chairs          617
Appliances      466
Labels          364
Tables          319
Envelopes       254
Bookcases       228
Fasteners       217
Supplies        190
Machines        115
Copiers          68
Name: Sub-Category, dtype: int64
```

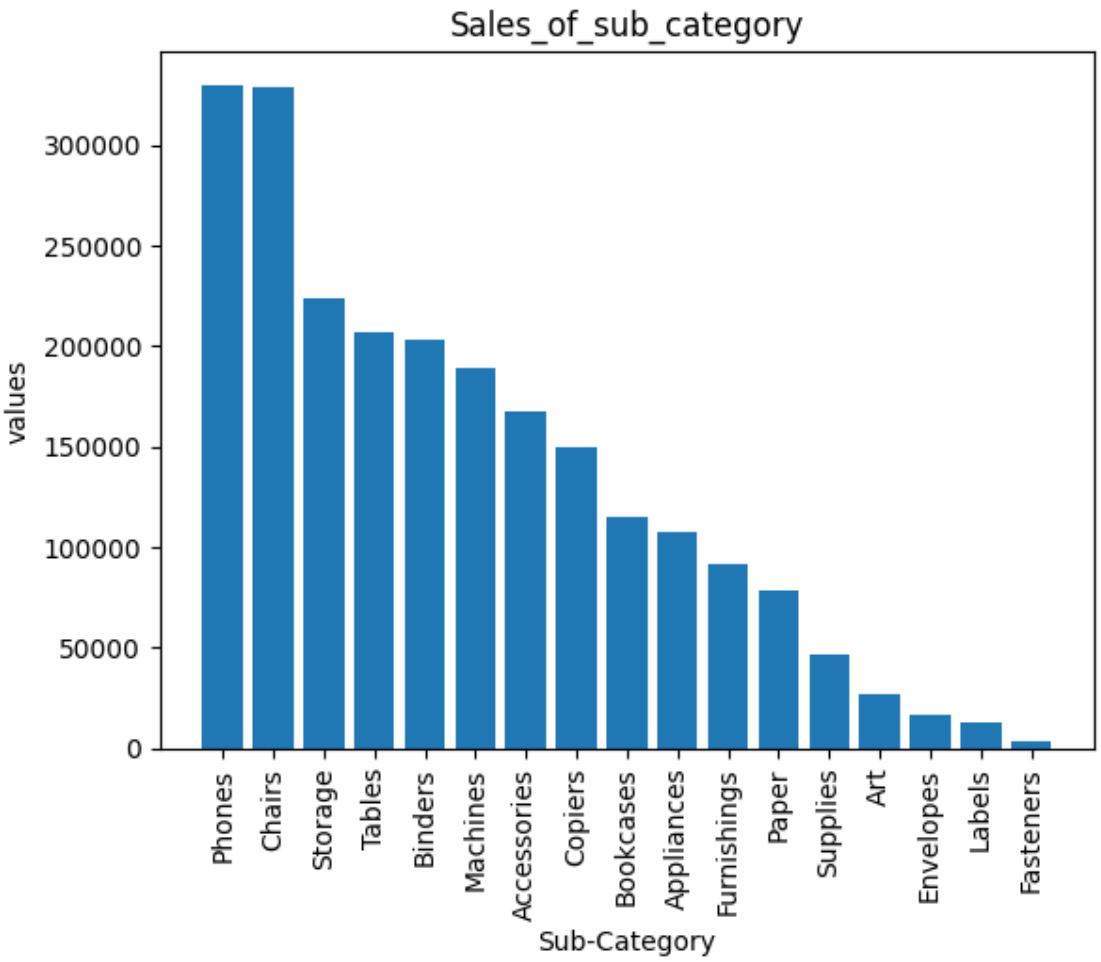
[ ]:
```
sales_by_sub_category = data.groupby('Sub-Category')['Sales'].sum().
↪reset_index().sort_values(by='Sales',ascending=False)
sales_by_sub_category
```

[ ]:

	Sub-Category	Sales
13	Phones	330007.0540
5	Chairs	328449.1030
14	Storage	223843.6080
16	Tables	206965.5320
3	Binders	203412.7330
11	Machines	189238.6310
0	Accessories	167380.3180
6	Copiers	149528.0300
4	Bookcases	114879.9963
1	Appliances	107532.1610
9	Furnishings	91705.1640
12	Paper	78479.2060
15	Supplies	46673.5380
2	Art	27118.7920
7	Envelopes	16476.4020
10	Labels	12486.3120
8	Fasteners	3024.2800

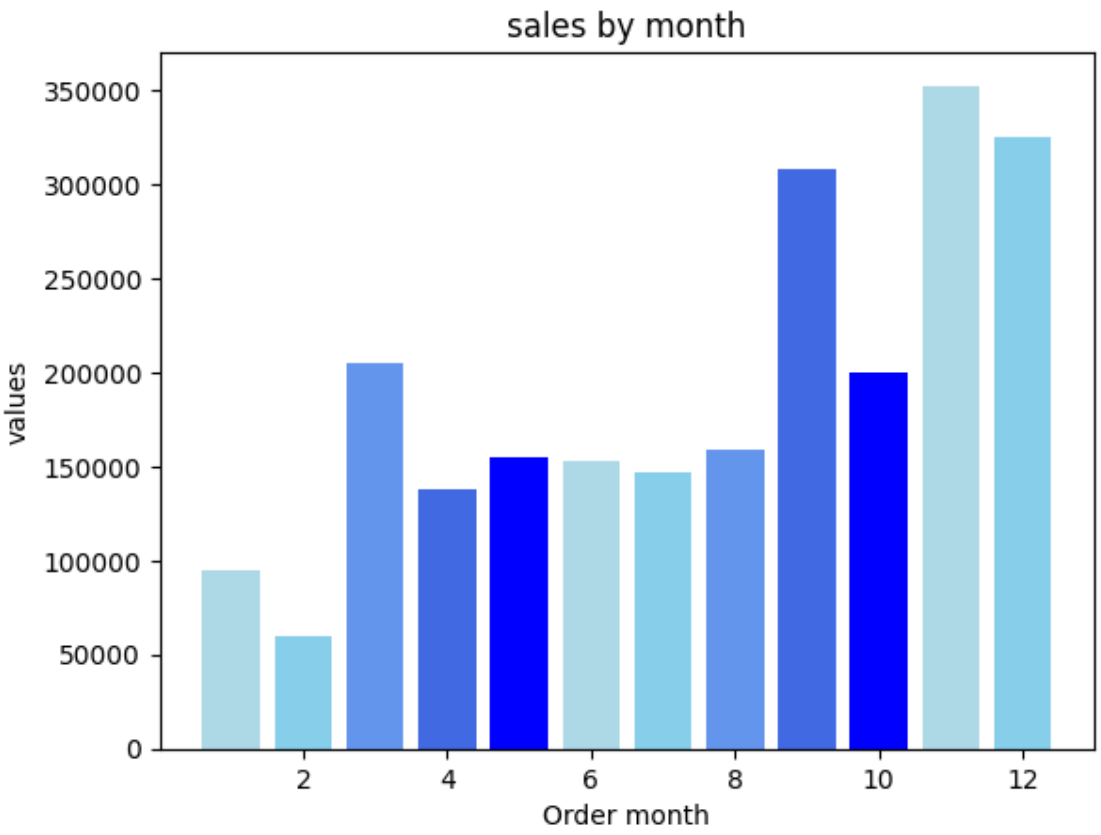
Now let's have a look at the sales by sub category

[ ]:
```
plt.bar(sales_by_sub_category['Sub-Category'],sales_by_sub_category['Sales'])
plt.title('Sales_of_sub_category')
plt.xlabel('Sub-Category')
plt.ylabel('values')
plt.xticks(rotation=90)
plt.show()
```



now let's have a look at the sales by month

[ ]:
```
colors = ['#ADD8E6', '#87CEEB', '#6495ED', '#4169E1', '#0000FF']
plt.bar(sales_by_month['Order Month'],sales_by_month['Sales'],color=colors)
plt.title('sales by month')
plt.xlabel('Order month')
plt.ylabel('values')
plt.show()
```



[ ]:
```
profit_by_month = data.groupby('Order Month')['Profit'].sum().reset_index()
profit_by_month
```

[ ]:

	Order Month	Profit
0	1	9134.4461
1	2	10294.6107
2	3	28594.6872
3	4	11587.4363
4	5	22411.3078
5	6	21285.7954
6	7	13832.6648
7	8	21776.9384
8	9	36857.4753
9	10	31784.0413
10	11	35468.4265
11	12	43369.1919

now let's have a look at the profit by month using line chart

[ ]:
```
plt.plot(profit_by_month['Order Month'],profit_by_month['Profit'])
plt.xlabel('Order Month')
plt.ylabel('Profit')
plt.title('Profit by month')
plt.show()
```

now let's have a look at the profit by month

[ ]:
```
plt.bar(profit_by_month['Order Month'],profit_by_month['Profit'])
plt.xlabel('Order Month')
plt.ylabel('Profit')
plt.title('Profit by month')
plt.show()
```

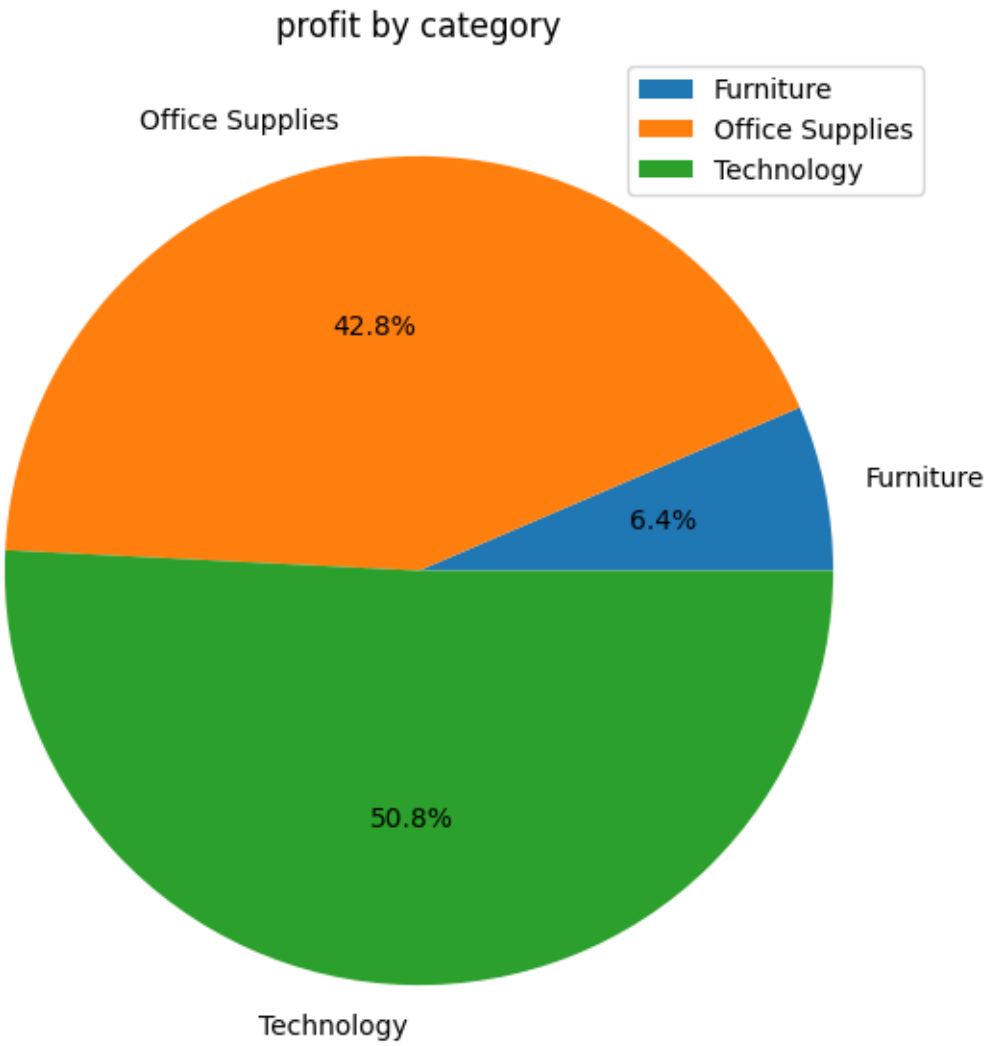
[ ]:
```
profit_by_category = data.groupby('Category')['Profit'].sum().reset_index()

profit_by_category
```

[ ]:
```
          Category       Profit
0        Furniture   18451.2728
1  Office Supplies  122490.8008
2       Technology  145454.9481
```

Now let's have a look at the profit by category:

[ ]:
```
labels = profit_by_category['Category']
sizes = profit_by_category['Profit']
plt.figure(figsize=(10,7))
plt.pie(sizes,labels=labels,autopct='%1.1f%%')
plt.title('profit by category')
plt.legend()
plt.show()
```



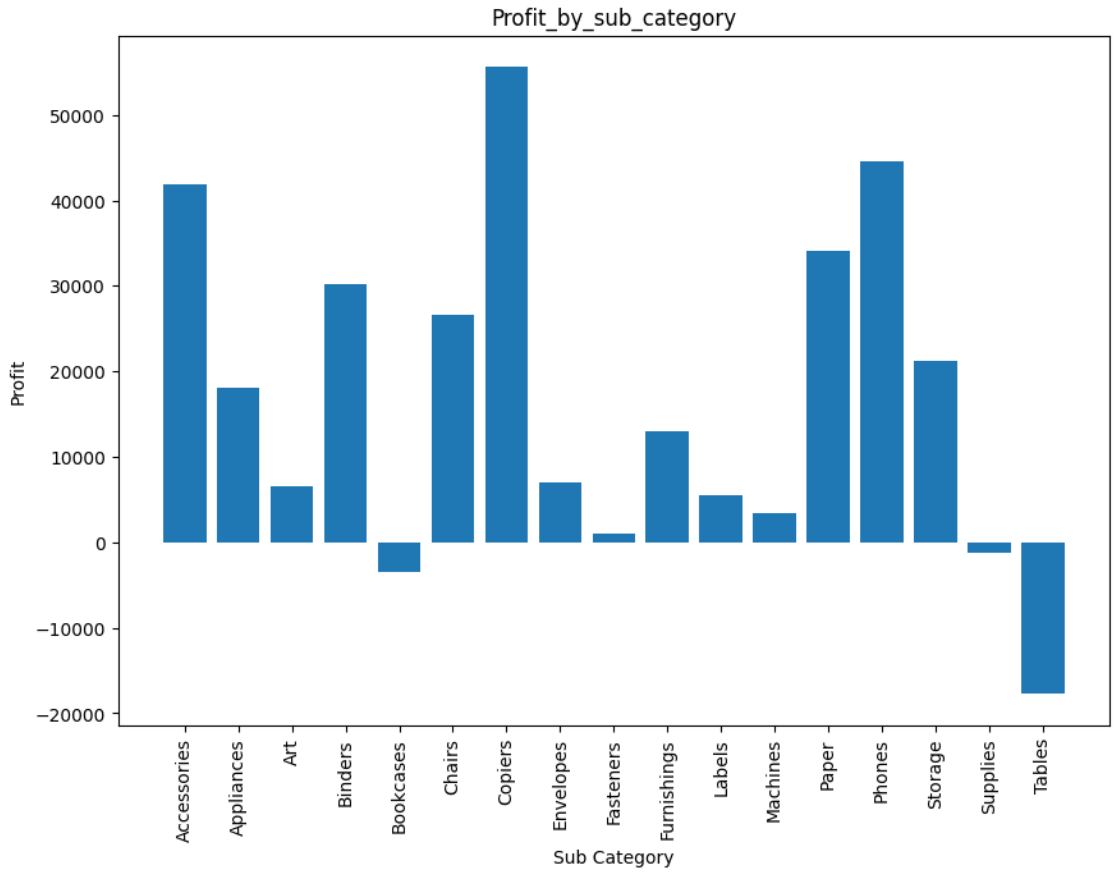
[ ]:
```
profit_by_sub_category = data.groupby('Sub-Category')['Profit'].sum().
↪reset_index()
profit_by_sub_category
```

[ ]:

	Sub-Category	Profit
0	Accessories	41936.6357
1	Appliances	18138.0054
2	Art	6527.7870
3	Binders	30221.7633
4	Bookcases	-3472.5560
5	Chairs	26590.1663
6	Copiers	55617.8249
7	Envelopes	6964.1767

```
8     Fasteners    949.5182
9   Furnishings  13059.1436
10       Labels   5546.2540
11     Machines   3384.7569
12        Paper  34053.5693
13       Phones  44515.7306
14      Storage  21278.8264
15     Supplies  -1189.0995
16       Tables -17725.4811
```

[ ]:
```
plt.figure(figsize=(10,7))
plt.bar(profit_by_sub_category['Sub-Category'],profit_by_sub_category['Profit'])
plt.title('Profit_by_sub_category')
plt.xticks(rotation=90)
plt.xlabel('Sub Category')
plt.ylabel('Profit')
plt.show()
```



[ ]:
```
pd.set_option('display.max_columns', None)
```

```
[ ]: data.head(2)
```

```
[ ]:    Row ID        Order ID Order Date  Ship Date     Ship Mode Customer ID  \
    0       1  CA-2016-152156 2016-11-08 2016-11-11  Second Class    CG-12520
    1       2  CA-2016-152156 2016-11-08 2016-11-11  Second Class    CG-12520

      Customer Name   Segment        Country       City     State  Postal Code  \
    0   Claire Gute  Consumer  United States  Henderson  Kentucky        42420
    1   Claire Gute  Consumer  United States  Henderson  Kentucky        42420

      Region       Product ID   Category Sub-Category  \
    0  South  FUR-BO-10001798  Furniture    Bookcases
    1  South  FUR-CH-10000454  Furniture       Chairs

                                        Product Name   Sales  Quantity  \
    0                 Bush Somerset Collection Bookcase  261.96         2
    1  Hon Deluxe Fabric Upholstered Stacking Chairs,…  731.94         3

       Discount    Profit  Order Month  Order Year  Order Day of Week
    0       0.0   41.9136           11        2016                  1
    1       0.0  219.5820           11        2016                  1
```

```
[ ]: data['Segment'].value_counts()
```

```
[ ]: Consumer       5191
    Corporate      3020
    Home Office    1783
    Name: Segment, dtype: int64
```

```
[ ]: sales_profit_by_segment = data.groupby('Segment').agg({'Sales':'sum','Profit':
      ↪'sum'}).reset_index()

    sales_profit_by_segment
```

```
[ ]:        Segment         Sales       Profit
    0     Consumer  1.161401e+06  134119.2092
    1    Corporate  7.061464e+05   91979.1340
    2  Home Office  4.296531e+05   60298.6785
```

So the store has higher profits from the product sales for consumers, but the profit from corporate product sales is better in the sales-to-profit ratio. Let's have a look at it to validate our findings:

```
[ ]: sales_profit_by_segment = data.groupby('Segment').agg({'Sales': 'sum', 'Profit':
      ↪ 'sum'}).reset_index()
    sales_profit_by_segment['Sales_to_Profit_Ratio'] =␣
      ↪sales_profit_by_segment['Sales'] / sales_profit_by_segment['Profit']
    print(sales_profit_by_segment[['Segment', 'Sales_to_Profit_Ratio']])
```

```
       Segment  Sales_to_Profit_Ratio
0     Consumer               8.659471
1    Corporate               7.677245
2  Home Office               7.125416
```

Summary

Store sales and profit analysis help businesses identify areas for improvement and make data-driven decisions to optimize their operations, pricing, marketing, and inventory management strategies to drive revenue and growth. I hope you liked this article on the task of analyzing the sales and profit of a store using Python.

[ ]: