```
import pandas as pd #clean

import plotly.express as px #visulization
import plotly.graph_objects as go #advance and customize graph
import plotly.io as pio #graph template
import plotly.colors as colors
pio.templates.default = "plotly_white"

data = pd.read_csv("Sample - Superstore.csv", encoding = 'latin-1')

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.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
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9994 entries, 0 to 9993
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Row ID         9994 non-null   int64
 1   Order ID       9994 non-null   object
 2   Order Date     9994 non-null   object
 3   Ship Date      9994 non-null   object
 4   Ship Mode      9994 non-null   object
 5   Customer ID    9994 non-null   object
 6   Customer Name  9994 non-null   object
 7   Segment        9994 non-null   object
 8   Country        9994 non-null   object
 9   City           9994 non-null   object
 10  State          9994 non-null   object
 11  Postal Code    9994 non-null   int64
 12  Region         9994 non-null   object
 13  Product ID     9994 non-null   object
 14  Category       9994 non-null   object
 15  Sub-Category   9994 non-null   object
 16  Product Name   9994 non-null   object
 17  Sales          9994 non-null   float64
 18  Quantity       9994 non-null   int64
 19  Discount       9994 non-null   float64
 20  Profit         9994 non-null   float64
dtypes: float64(3), int64(3), object(15)
memory usage: 1.6+ MB
```

Converting date columns

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

data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9994 entries, 0 to 9993
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Row ID         9994 non-null   int64
 1   Order ID       9994 non-null   object
 2   Order Date     9994 non-null   datetime64[ns]
 3   Ship Date      9994 non-null   datetime64[ns]
 4   Ship Mode      9994 non-null   object
 5   Customer ID    9994 non-null   object
 6   Customer Name  9994 non-null   object
```

```
 7   Segment        9994 non-null   object
 8   Country        9994 non-null   object
 9   City           9994 non-null   object
 10  State          9994 non-null   object
 11  Postal Code    9994 non-null   int64
 12  Region         9994 non-null   object
 13  Product ID     9994 non-null   object
 14  Category       9994 non-null   object
 15  Sub-Category   9994 non-null   object
 16  Product Name   9994 non-null   object
 17  Sales          9994 non-null   float64
 18  Quantity       9994 non-null   int64
 19  Discount       9994 non-null   float64
 20  Profit         9994 non-null   float64
dtypes: datetime64[ns](2), float64(3), int64(3), object(13)
memory usage: 1.6+ MB

data.head()

   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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['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

data.head()
```

```
   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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  ...

          Category  Sub-Category  \
```

```
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  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  Order Month  Order Year  Order Day of Week
0     0.00   41.9136           11        2016                  1
1     0.00  219.5820           11        2016                  1
2     0.00    6.8714            6        2016                  6
3     0.45 -383.0310           10        2015                  6
4     0.20    2.5164           10        2015                  6

[5 rows x 24 columns]
```

Monthly sales analysis

```
sales_by_month = data.groupby('Order Month')
['Sales'].sum().reset_index()

sales_by_month
```

```
    Order Month        Sales
0             1   94924.8356
1             2   59751.2514
2             3  205005.4888
3             4  137762.1286
4             5  155028.8117
5             6  152718.6793
6             7  147238.0970
7             8  159044.0630
8             9  307649.9457
9            10  200322.9847
10           11  352461.0710
11           12  325293.5035
```

```
fig = px.line(sales_by_month,
              x='Order Month',
              y='Sales',
              title='Monthly Sales Analysis')
fig.show()
```


```
data.head()
```

```
   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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  ...

          Category  Sub-Category  \
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  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	Order Month	Order Year	Order Day of Week
0	0.00	41.9136	11	2016	1
1	0.00	219.5820	11	2016	1
2	0.00	6.8714	6	2016	6
3	0.45	-383.0310	10	2015	6
4	0.20	2.5164	10	2015	6

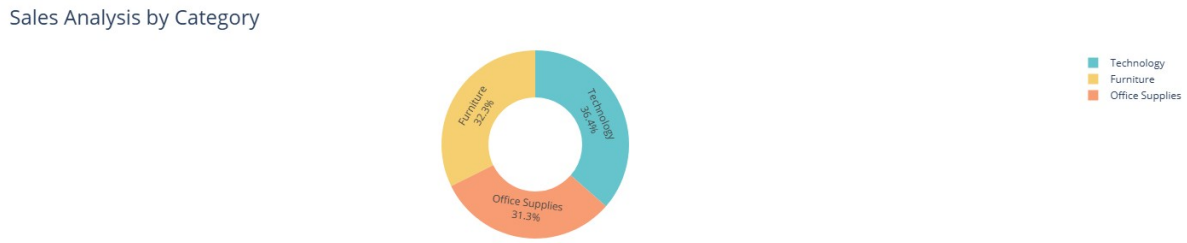
```
[5 rows x 24 columns]
```

Sales by Category

```
sales_by_category = data.groupby('Category')
['Sales'].sum().reset_index()

sales_by_category
```

	Category	Sales
0	Furniture	741999.7953
1	Office Supplies	719047.0320
2	Technology	836154.0330

```
fig = px.pie(sales_by_category,
             values='Sales',
             names='Category',
             hole=0.5,
             color_discrete_sequence=px.colors.qualitative.Pastel)

fig.update_traces(textposition='inside', textinfo='percent+label')

fig.update_layout(title='Sales Analysis by Category',
title_font=dict(size=24))

fig.show()
```



Sales analysis by sub Category

```
data.head()
```

```
   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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  ...

          Category  Sub-Category  \
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  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
```

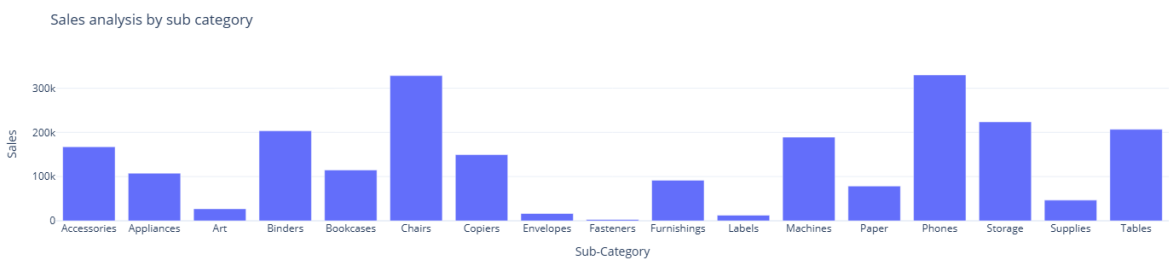
	Discount	Profit	Order Month	Order Year	Order Day of Week
0	0.00	41.9136	11	2016	1
1	0.00	219.5820	11	2016	1
2	0.00	6.8714	6	2016	6
3	0.45	-383.0310	10	2015	6
4	0.20	2.5164	10	2015	6

[5 rows x 24 columns]

```
sales_by_subcategory = data.groupby('Sub-Category')
['Sales'].sum().reset_index()

sales_by_subcategory
```

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

```
fig = px.bar(sales_by_subcategory, x = 'Sub-Category', y = 'Sales',
title = "Sales analysis by sub category")
fig.show()
```



Monthly profit Analysis

```
data.head()
```

```
   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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  ...

          Category  Sub-Category  \
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  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  Order Month  Order Year  Order Day of Week
0     0.00   41.9136           11        2016                  1
1     0.00  219.5820           11        2016                  1
2     0.00    6.8714            6        2016                  6
3     0.45 -383.0310           10        2015                  6
4     0.20    2.5164           10        2015                  6
```

```
[5 rows x 24 columns]
```

```
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

```
fig = px.bar(profit_by_month, x = 'Order Month', y = 'Profit', title =
'Monthly Profit Analysis')
fig.show()
```

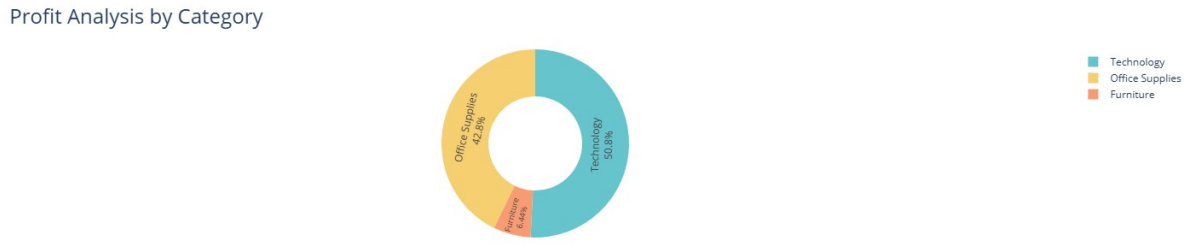
Profit by Category

```
profit_by_category = data.groupby('Category', as_index=False)
['Profit'].sum()

profit_by_category
```

	Category	Profit
0	Furniture	18451.2728
1	Office Supplies	122490.8008
2	Technology	145454.9481

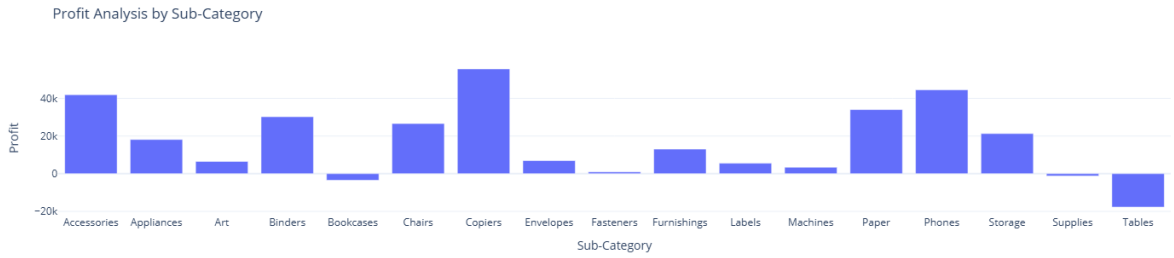
```
fig = px.pie(profit_by_category,
             values='Profit',
```

```
             names='Category',
             hole=0.5,
             color_discrete_sequence=px.colors.qualitative.Pastel)

fig.update_traces(textposition='inside', textinfo='percent+label')

fig.update_layout(title='Profit Analysis by Category',
title_font=dict(size=24))

fig.show()
```



Profit By Sub Category

```
profit_by_subcategory = data.groupby('Sub-Category')
['Profit'].sum().reset_index()
fig = px.bar(profit_by_subcategory, x='Sub-Category',
             y='Profit',
             title='Profit Analysis by Sub-Category')
fig.show()
```



sales and profit - customer segment

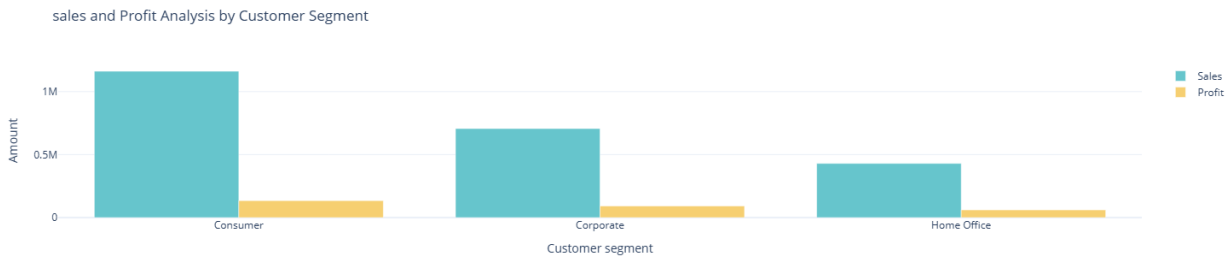
```
data.head()
```

```
   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
2       3  CA-2016-138688 2016-06-12 2016-06-16    Second Class    DV-
13045
3       4  US-2015-108966 2015-10-11 2015-10-18  Standard Class    SO-
20335
4       5  US-2015-108966 2015-10-11 2015-10-18  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  ...

          Category  Sub-Category  \
0        Furniture     Bookcases
1        Furniture        Chairs
2  Office Supplies        Labels
3        Furniture        Tables
4  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  Order Month  Order Year  Order Day of Week
0     0.00   41.9136           11        2016                  1
1     0.00  219.5820           11        2016                  1
2     0.00    6.8714            6        2016                  6
3     0.45 -383.0310           10        2015                  6
4     0.20    2.5164           10        2015                  6

[5 rows x 24 columns]
```

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

color_palette = colors.qualitative.Pastel
```

```
fig = go.Figure()
fig.add_trace(go.Bar(x=sales_profit_by_segment['Segment'],
                     y=sales_profit_by_segment['Sales'],
                     name='Sales',
                     marker_color=color_palette[0]))

fig.add_trace(go.Bar(x=sales_profit_by_segment['Segment'],
                     y=sales_profit_by_segment['Profit'],
                     name='Profit',
                     marker_color=color_palette[1]))

fig.update_layout(title='sales and Profit Analysis by Customer
Segment',
                  xaxis_title='Customer segment',
yaxis_title='Amount')

fig.show()
```



Sales to profit ratio

```
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
```