In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
sns.set()
%matplotlib inline
from scipy import stats

import warnings
warnings.simplefilter("ignore")

sns.set_theme(style='darkgrid')

f2 = {"family":"cambria","color":"g","size":50}
f3  = {"family":"cambria","color":"k","size":40}
f1 = {"family":"cambria","color":"r","size":30}

from sklearn.linear_model import LinearRegression,Lasso, LogisticRegression  #
from sklearn.model_selection import train_test_split,cross_val_score
from sklearn.metrics import confusion_matrix,accuracy_score,f1_score,recall_sc
from sklearn.preprocessing import MinMaxScaler,LabelEncoder,OneHotEncoder
from sklearn.preprocessing import StandardScaler,RobustScaler
```

```
C:\ProgramData\Anaconda3\envs\lib\site-packages\scipy\__init__.py:146: UserWa
rning: A NumPy version >=1.16.5 and <1.23.0 is required for this version of S
ciPy (detected version 1.26.0
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
```

In [2]:

```
df1 = pd.read_csv(r"C:\Users\Sinha Rahul\Documents\Superstore csv.csv")
```

In [3]:

```
df1
```

Out[3]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	co
0	AG-2011-2040	1/1/2011	6/1/2011	Standard Class	Toby Braunhardt	Consumer	Constantine	A
1	IN-2011-47883	1/1/2011	8/1/2011	Standard Class	Joseph Holt	Consumer	New South Wales	Au
2	HU-2011-1220	1/1/2011	5/1/2011	Second Class	Annie Thurman	Consumer	Budapest	Hu
3	IT-2011-3647632	1/1/2011	5/1/2011	Second Class	Eugene Moren	Home Office	Stockholm	Sv
4	IN-2011-47883	1/1/2011	8/1/2011	Standard Class	Joseph Holt	Consumer	New South Wales	Au
...	...	...	...	...	...	...	...	
51285	CA-2014-115427	31-12-2014	4/1/2015	Standard Class	Erica Bern	Corporate	California	U S
51286	MO-2014-2560	31-12-2014	5/1/2015	Standard Class	Liz Preis	Consumer	Souss-Massa-Draâ	Mc
51287	MX-2014-110527	31-12-2014	2/1/2015	Second Class	Charlotte Melton	Consumer	Managua	Nica
51288	MX-2014-114783	31-12-2014	6/1/2015	Standard Class	Tamara Dahlen	Consumer	Chihuahua	M
51289	CA-2014-156720	31-12-2014	4/1/2015	Standard Class	Jill Matthias	Consumer	Colorado	U S

51290 rows × 21 columns

Display Top 10 row in dataset

In [4]:
```
df1.head(10)
```

Out[4]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	country
0	AG-2011-2040	1/1/2011	6/1/2011	Standard Class	Toby Braunhardt	Consumer	Constantine	Algeria
1	IN-2011-47883	1/1/2011	8/1/2011	Standard Class	Joseph Holt	Consumer	New South Wales	Australia
2	HU-2011-1220	1/1/2011	5/1/2011	Second Class	Annie Thurman	Consumer	Budapest	Hungary
3	IT-2011-3647632	1/1/2011	5/1/2011	Second Class	Eugene Moren	Home Office	Stockholm	Sweden
4	IN-2011-47883	1/1/2011	8/1/2011	Standard Class	Joseph Holt	Consumer	New South Wales	Australia
5	IN-2011-47883	1/1/2011	8/1/2011	Standard Class	Joseph Holt	Consumer	New South Wales	Australia
6	CA-2011-1510	2/1/2011	6/1/2011	Standard Class	Magdelene Morse	Consumer	Ontario	Canada
7	IN-2011-79397	3/1/2011	3/1/2011	Same Day	Kean Nguyen	Corporate	New South Wales	Australia
8	ID-2011-80230	3/1/2011	9/1/2011	Standard Class	Ken Lonsdale	Consumer	Auckland	New Zealand
9	IZ-2011-4680	3/1/2011	7/1/2011	Standard Class	Lindsay Williams	Corporate	Ninawa	Iraq

10 rows × 21 columns

Display tail 10 row in dataset

In [5]:
```
df1.tail(10)
```

Out[5]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	c
51280	TZ-2014-8220	31-12-2014	6/1/2015	Standard Class	Christine Kargatis	Home Office	Dar Es Salaam	Ta
51281	CA-2014-115427	31-12-2014	4/1/2015	Standard Class	Erica Bern	Corporate	California	
51282	UP-2014-4410	31-12-2014	4/1/2015	Standard Class	Guy Thornton	Consumer	Zaporizhzhya	I
51283	IN-2014-23754	31-12-2014	7/1/2015	Standard Class	Kalyca Meade	Corporate	Guangdong	
51284	MX-2014-108574	31-12-2014	4/1/2015	Standard Class	Julia Barnett	Home Office	Tamaulipas	
51285	CA-2014-115427	31-12-2014	4/1/2015	Standard Class	Erica Bern	Corporate	California	
51286	MO-2014-2560	31-12-2014	5/1/2015	Standard Class	Liz Preis	Consumer	Souss-Massa-Draâ	M
51287	MX-2014-110527	31-12-2014	2/1/2015	Second Class	Charlotte Melton	Consumer	Managua	Nic
51288	MX-2014-114783	31-12-2014	6/1/2015	Standard Class	Tamara Dahlen	Consumer	Chihuahua	
51289	CA-2014-156720	31-12-2014	4/1/2015	Standard Class	Jill Matthias	Consumer	Colorado	

10 rows × 21 columns

Find the shape of our dataset(number of column & number of row)

In [6]:
```
df1.shape
```

Out[6]:
```
(51290, 21)
```

In [7]:
```
print("number of column is",df1.shape[0])
```

```
number of column is 51290
```

In [8]:
```
print("number of row is",df1.shape[1])
```

```
number of row is 21
```

Find the size of our dataset

In [9]:
```
df1.size
```

Out[9]:
```
1077090
```

Getting information about our dataset likes total number of rows, total number of columns,data type of each column and memory requirement

In [10]:
```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 51290 entries, 0 to 51289
Data columns (total 21 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   order_id        51290 non-null  object 
 1   order_date      51290 non-null  object 
 2   ship_date       51290 non-null  object 
 3   ship_mode       51290 non-null  object 
 4   customer_name   51290 non-null  object 
 5   segment         51290 non-null  object 
 6   state           51290 non-null  object 
 7   country         51290 non-null  object 
 8   market          51290 non-null  object 
 9   region          51290 non-null  object 
 10  product_id      51290 non-null  object 
 11  category        51290 non-null  object 
 12  sub_category    51290 non-null  object 
 13  product_name    51290 non-null  object 
 14  sales           51290 non-null  object 
 15  quantity        51290 non-null  int64  
 16  discount        51290 non-null  float64
 17  profit          51290 non-null  float64
 18  shipping_cost   51290 non-null  float64
 19  order_priority  51290 non-null  object 
 20  year            51290 non-null  int64  
dtypes: float64(3), int64(2), object(16)
memory usage: 8.2+ MB
```

In [11]:

```
df1.info( memory_usage='deep')
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 51290 entries, 0 to 51289
Data columns (total 21 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   order_id        51290 non-null  object 
 1   order_date      51290 non-null  object 
 2   ship_date       51290 non-null  object 
 3   ship_mode       51290 non-null  object 
 4   customer_name   51290 non-null  object 
 5   segment         51290 non-null  object 
 6   state           51290 non-null  object 
 7   country         51290 non-null  object 
 8   market          51290 non-null  object 
 9   region          51290 non-null  object 
 10  product_id      51290 non-null  object 
 11  category        51290 non-null  object 
 12  sub_category    51290 non-null  object 
 13  product_name    51290 non-null  object 
 14  sales           51290 non-null  object 
 15  quantity        51290 non-null  int64  
 16  discount        51290 non-null  float64
 17  profit          51290 non-null  float64
 18  shipping_cost   51290 non-null  float64
 19  order_priority  51290 non-null  object 
 20  year            51290 non-null  int64  
dtypes: float64(3), int64(2), object(16)
memory usage: 55.0 MB
```

Changing the Incorrect Data Types

In [12]:

```
df1["order_date"] = df1["order_date"].astype('datetime64[ns]')
df1["ship_date"] = df1["ship_date"].astype("datetime64[ns]")
df1['sales'] = pd.to_numeric(df1['sales'], errors= "coerce")
```

In [13]:
```
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 51290 entries, 0 to 51289
Data columns (total 21 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   order_id        51290 non-null  object
 1   order_date      51290 non-null  datetime64[ns]
 2   ship_date       51290 non-null  datetime64[ns]
 3   ship_mode       51290 non-null  object
 4   customer_name   51290 non-null  object
 5   segment         51290 non-null  object
 6   state           51290 non-null  object
 7   country         51290 non-null  object
 8   market          51290 non-null  object
 9   region          51290 non-null  object
 10  product_id      51290 non-null  object
 11  category        51290 non-null  object
 12  sub_category    51290 non-null  object
 13  product_name    51290 non-null  object
 14  sales           48660 non-null  float64
```

In [14]:
```
df1.isnull().sum()
```

Out[14]:
```
order_id             0
order_date           0
ship_date            0
ship_mode            0
customer_name        0
segment              0
state                0
country              0
market               0
region               0
product_id           0
category             0
sub_category         0
product_name         0
sales             2630
quantity             0
discount             0
profit               0
shipping_cost        0
order_priority       0
```

In [15]:
```
df1 = df1.dropna()
```

In [16]:
```
df1.isnull().sum()
```

Out[16]:
```
order_id          0
order_date        0
ship_date         0
ship_mode         0
customer_name     0
segment           0
state             0
country           0
market            0
region            0
product_id        0
category          0
sub_category      0
product_name      0
sales             0
quantity          0
discount          0
profit            0
shipping_cost     0
order_priority    0
year              0
dtype: int64
```

check missing value in dataset

check duplicate value in dataset

In [17]:
```
df1.duplicated().values.any()
```

Out[17]:
```
False
```

Get overall statistics about the dataframe

In [18]:

```
df1.describe()
```

Out[18]:

	sales	quantity	discount	profit	shipping_cost	year
count	48660.000000	48660.000000	48660.000000	48660.000000	48660.000000	48660.000000
mean	161.017838	3.350658	0.145722	14.688249	17.593780	2012.777579
std	201.092519	2.198216	0.215066	86.825672	28.559365	1.098732
min	0.000000	1.000000	0.000000	-1924.542000	0.000000	2011.000000
25%	29.000000	2.000000	0.000000	0.000000	2.450000	2012.000000
50%	77.000000	3.000000	0.000000	8.460000	7.030000	2013.000000
75%	208.000000	4.000000	0.200000	31.154400	20.152500	2014.000000
max	999.000000	14.000000	0.850000	486.600000	427.100000	2014.000000

correlation

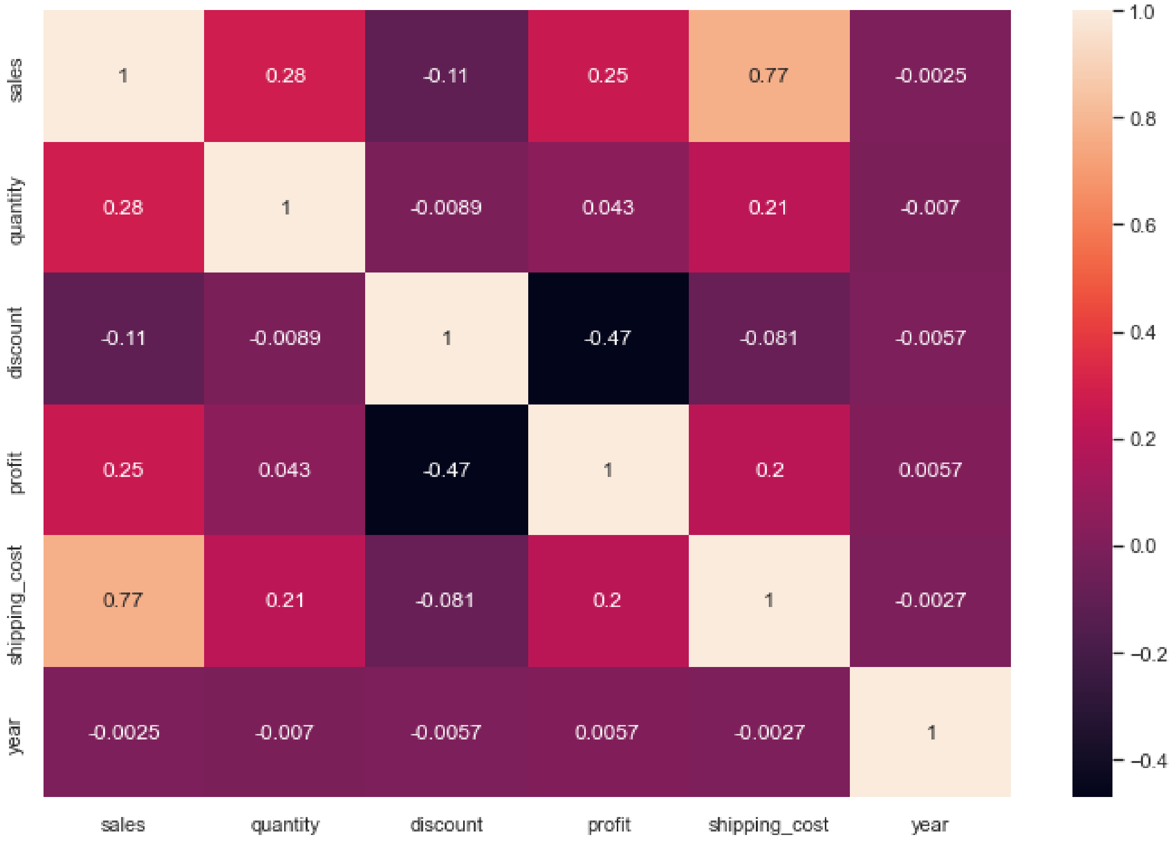
In [19]:

```
df1.corr()
```

Out[19]:

	sales	quantity	discount	profit	shipping_cost	year
sales	1.000000	0.276072	-0.106719	0.252703	0.771133	-0.002479
quantity	0.276072	1.000000	-0.008913	0.043134	0.207242	-0.006984
discount	-0.106719	-0.008913	1.000000	-0.472681	-0.081453	-0.005690
profit	0.252703	0.043134	-0.472681	1.000000	0.204664	0.005668
shipping_cost	0.771133	0.207242	-0.081453	0.204664	1.000000	-0.002724
year	-0.002479	-0.006984	-0.005690	0.005668	-0.002724	1.000000

In [20]:
```
plt.figure(figsize=(12,8))
sns.heatmap(df1.corr(),annot = True)
plt.show()
```



EDA

Q1: Which segment is the best seller?

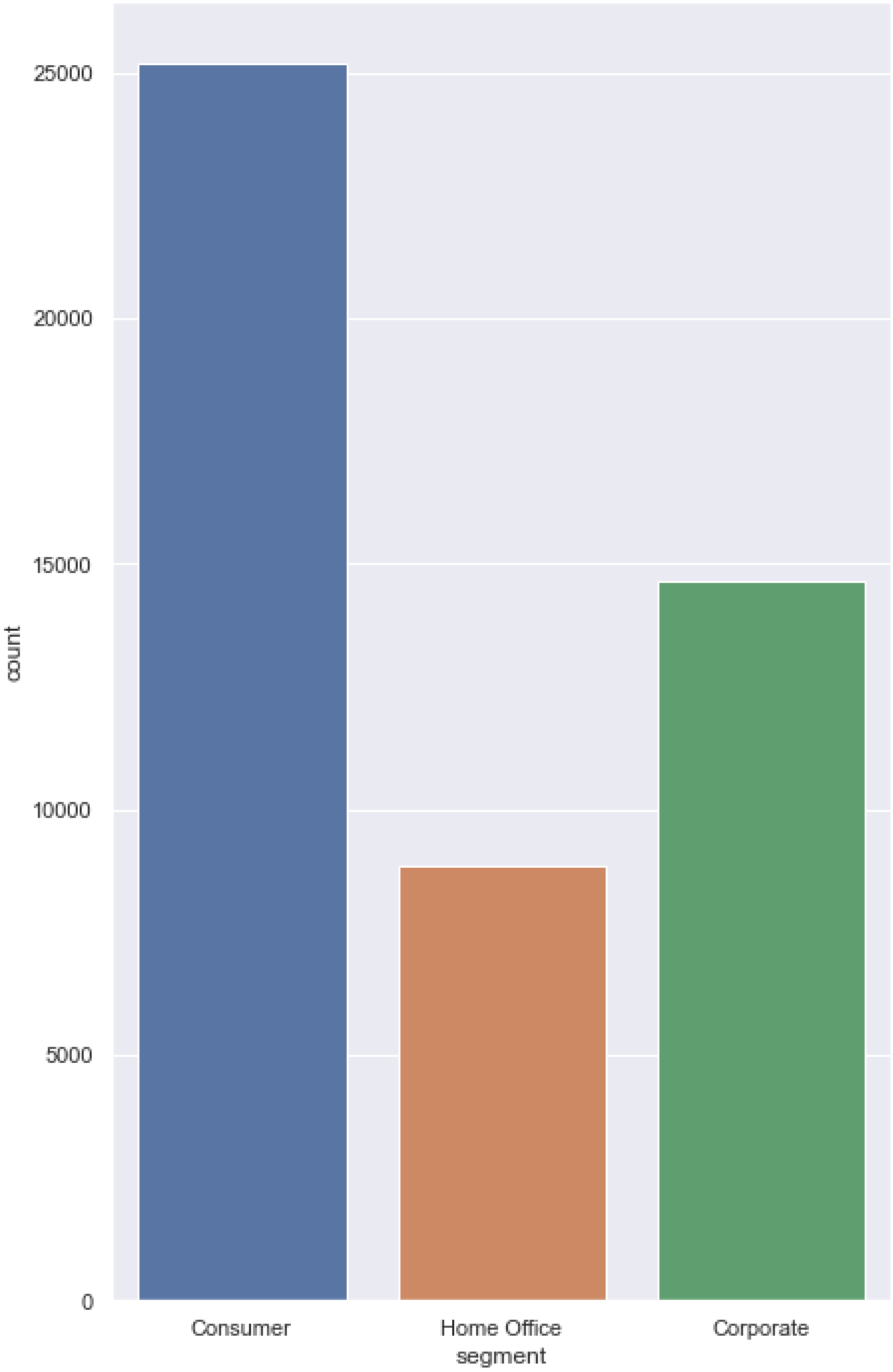
In [21]:
```
df1.columns
```

Out[21]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [22]:
```
df1["segment"].unique()
```

Out[22]:
```
array(['Consumer', 'Home Office', 'Corporate'], dtype=object)
```

In [23]:
```
plt.figure(figsize=(7,12))
sns.countplot(df1["segment"])
plt.show()
```



Q2: Which Region has the highest order count and In which Region do we need to grow our Business?¶

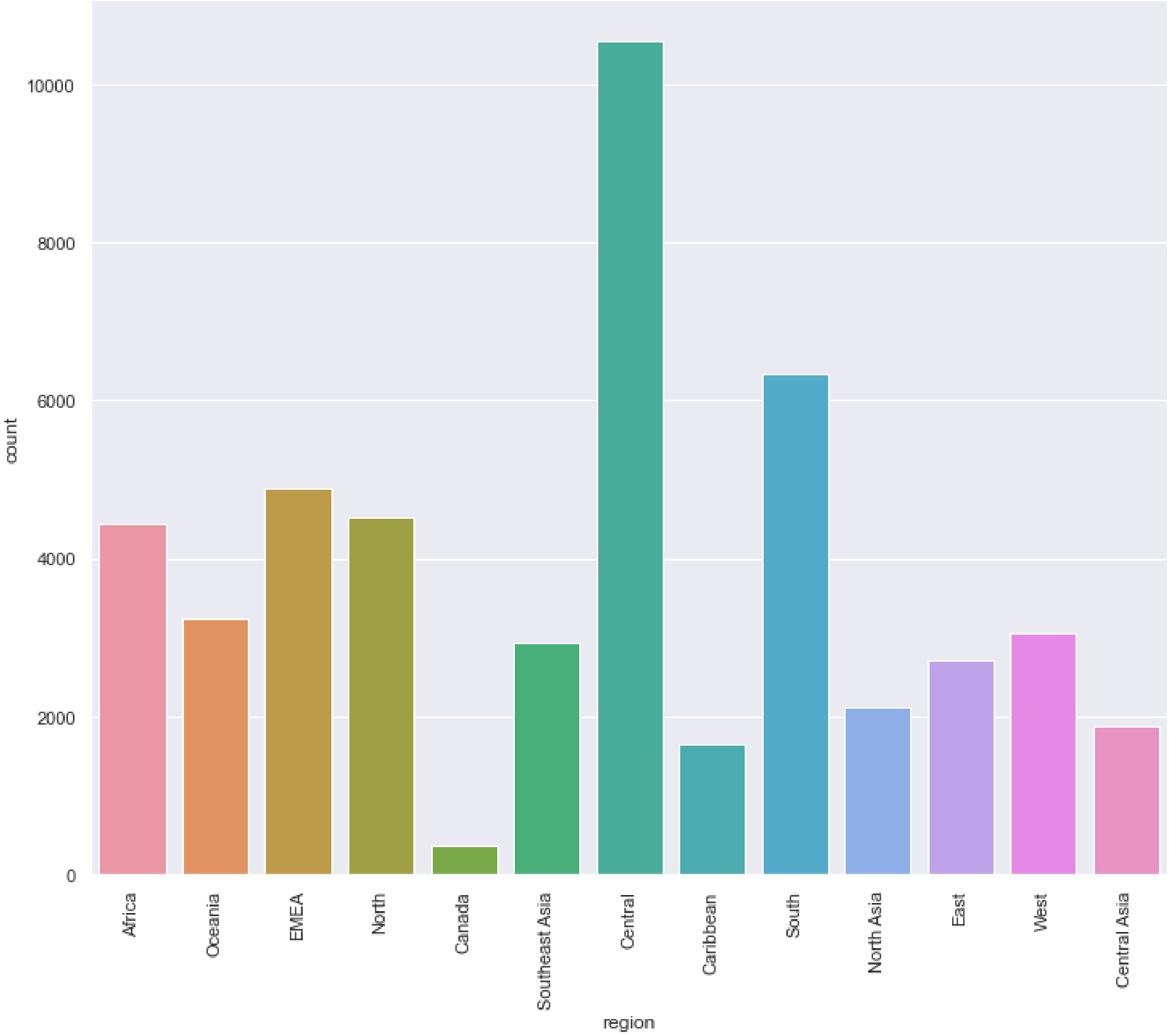
In [24]:
```
df1.columns
```

Out[24]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [25]:
```
df1["region"].unique()
```

Out[25]:
```
array(['Africa', 'Oceania', 'EMEA', 'North', 'Canada', 'Southeast Asia',
       'Central', 'Caribbean', 'South', 'North Asia', 'East', 'West',
       'Central Asia'], dtype=object)
```

In [26]:
```
plt.figure(figsize=(12,10))
sns.countplot(df1["region"])
plt.xticks(rotation=90)
plt.show()
```



Q3: Who are the Top 10 Customers of the SuperStore and How much is their Repartition

of the Profit?¶

In [27]:
```
df1.columns
```

Out[27]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [28]:
```
df1["customer_name"].nunique()
```

Out[28]:
```
795
```

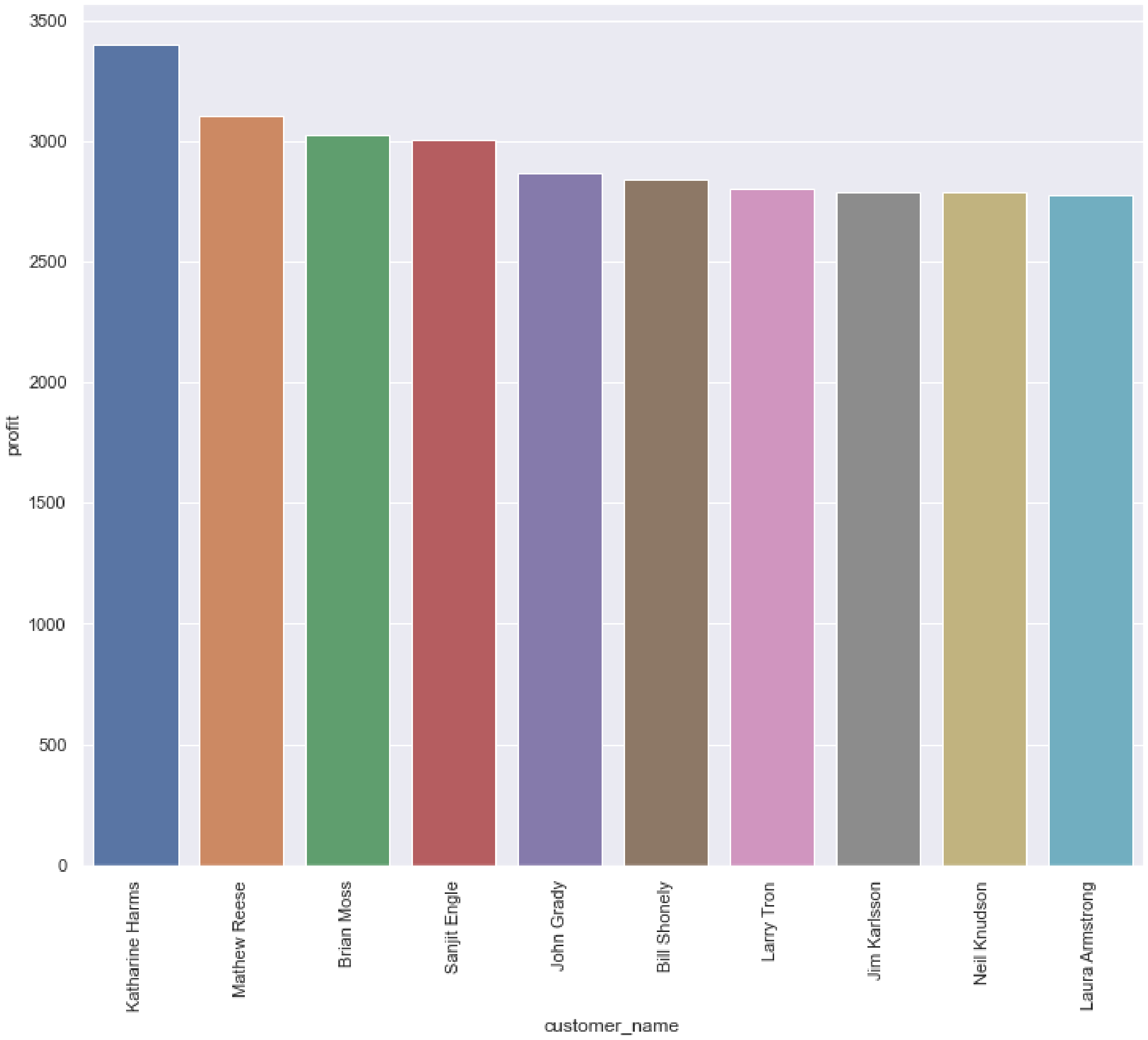
In [29]:
```
df2 = df1.groupby("customer_name")["profit"].sum().reset_index()
df3 = df2.sort_values(by = "profit",ascending=False).head(10).round(0)
df3
```

Out[29]:

	customer_name	profit
421	Katharine Harms	3400.0
502	Mathew Reese	3105.0
109	Brian Moss	3028.0
673	Sanjit Engle	3007.0
386	John Grady	2870.0
90	Bill Shonely	2840.0
450	Larry Tron	2805.0
374	Jim Karlsson	2791.0
565	Neil Knudson	2790.0
451	Laura Armstrong	2774.0

In [30]:

```python
plt.figure(figsize=(12,10))
sns.barplot(x = "customer_name",y = "profit", data = df3)
plt.xticks(rotation = 90)
plt.show()
```



How much each Sub-Category is contributing in Sales of SuperStore?

In [31]:

```python
df1.columns
```

Out[31]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [32]:
```
df1["sub_category"].unique()
```

Out[32]:
```
array(['Storage', 'Supplies', 'Paper', 'Furnishings', 'Machines',
       'Appliances', 'Copiers', 'Chairs', 'Tables', 'Bookcases', 'Phones',
       'Accessories', 'Labels', 'Art', 'Envelopes', 'Fasteners',
       'Binders'], dtype=object)
```

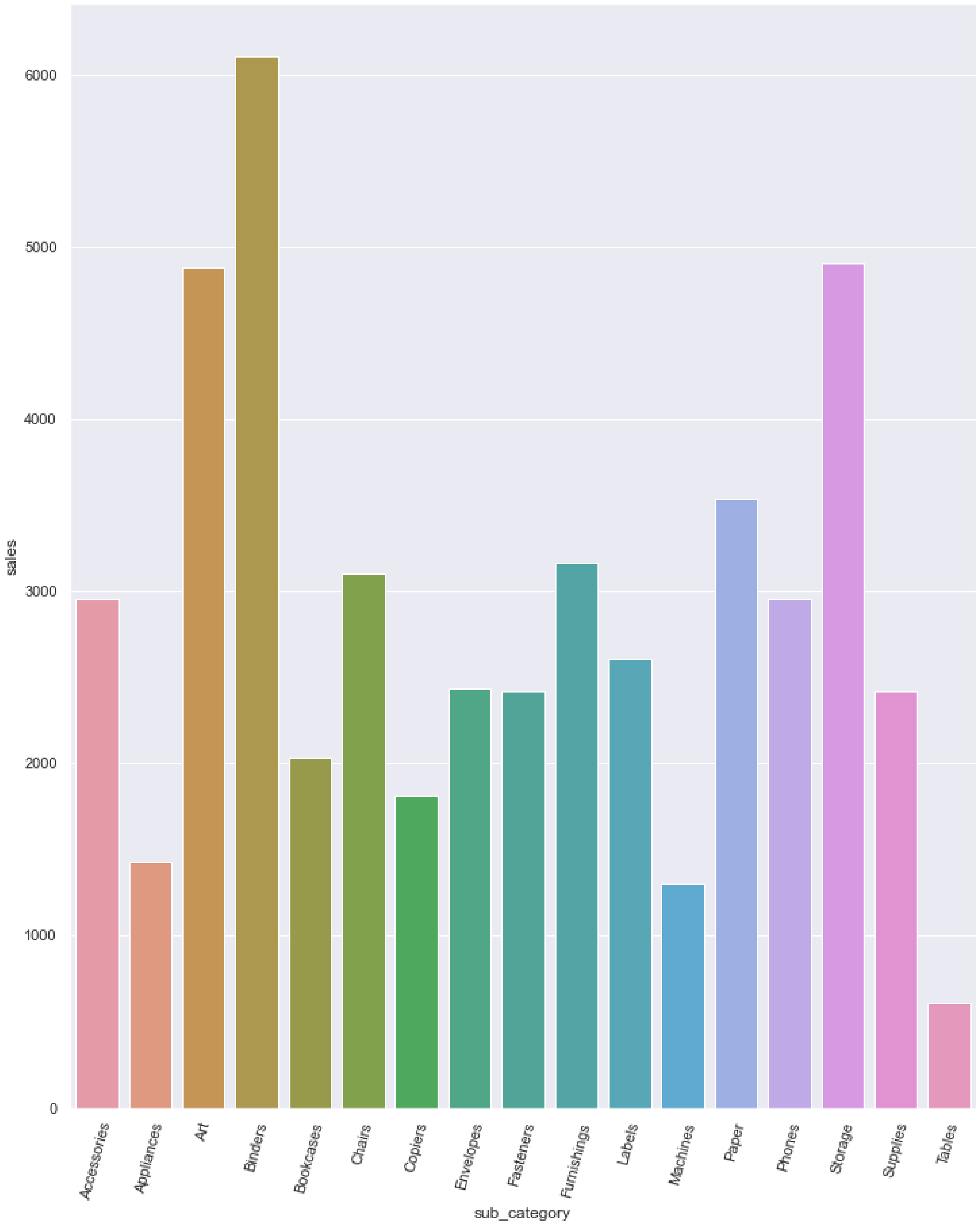
In [33]:
```
df4 = df1.groupby("sub_category")["sales"].count().reset_index()
df4
```

Out[33]:

	sub_category	sales
0	Accessories	2956
1	Appliances	1427
2	Art	4882
3	Binders	6108
4	Bookcases	2031
5	Chairs	3105
6	Copiers	1810
7	Envelopes	2435
8	Fasteners	2420
9	Furnishings	3163
10	Labels	2606
11	Machines	1302
12	Paper	3538
13	Phones	2950
14	Storage	4903
15	Supplies	2417
16	Tables	607

In [34]:

```
plt.figure(figsize=(12,15))
sns.barplot(x = "sub_category", y = "sales", data= df4,saturation=0.65)
plt.xticks(rotation = 75)
plt.show()
```



What are the Top 10 States with highest Order Count?¶

In [35]:
```
df1.columns
```

Out[35]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [36]:
```
df1["state"].nunique()
```

Out[36]:
```
1088
```

In [37]:
```
df5 = df1.groupby("state")["sales"].count().sort_values(ascending=False).head(
df5
```

Out[37]:

	state	sales
0	California	1901
1	England	1388
2	New York	1060
3	Texas	959
4	Ile-de-France	900
5	New South Wales	715
6	North Rhine-Westphalia	670
7	Queensland	659
8	San Salvador	586
9	Pennsylvania	565

# Look for Top 10 Consumer Countries is contributing in sales of supermarket

In [38]:
```
df1.columns
```

Out[38]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [39]:
```
df1["country"].unique()
```

Out[39]:
```
array(['Algeria', 'Australia', 'Hungary', 'Sweden', 'Canada',
       'New Zealand', 'Iraq', 'Philippines', 'United Kingdom', 'Malaysia',
       'Guatemala', 'Iran', 'Thailand', 'Tanzania', 'Mexico', 'Cuba',
       'France', 'Brazil', 'United States', 'Japan', 'Sudan', 'Taiwan',
       'Indonesia', 'Vietnam', 'Angola', 'China', 'Mozambique', 'Lebanon',
       'Singapore', 'Netherlands', 'Nigeria', 'Egypt', 'Venezuela',
       'South Africa', 'Spain', 'India', 'Turkey', 'Austria', 'Italy',
       'Germany', 'Nicaragua', 'Dominican Republic', 'Denmark',
       'Saudi Arabia', 'Zambia', 'Myanmar (Burma)', 'Russia', 'Mongolia',
       'Belgium', 'Kenya', 'El Salvador', 'Colombia', 'Estonia',
       'Madagascar', 'Portugal', 'Morocco', 'Sierra Leone', 'Norway',
       'Central African Republic', 'Czech Republic', 'Benin',
       'Bangladesh', 'Panama', 'Chile', 'South Korea', 'Switzerland',
       'Moldova', 'Uganda', 'Zimbabwe', 'Niger', 'Senegal', 'Hong Kong',
       'Democratic Republic of the Congo', 'Poland', 'Ireland',
       'Pakistan', 'Azerbaijan', 'Ukraine', 'Romania', 'Honduras',
       'Israel', 'Cameroon', 'Cambodia', 'Georgia', 'Argentina',
       'Finland', 'Lithuania', 'Peru', 'Somalia', 'Haiti',
       "Cote d'Ivoire", 'Afghanistan', 'Guinea', 'Liberia', 'South Sudan',
       'Turkmenistan', 'Kazakhstan', 'Lesotho', 'Burundi', 'Qatar',
       'Bulgaria', 'Martinique', 'Croatia', 'Ghana', 'Rwanda', 'Ecuador',
       'Paraguay', 'Ethiopia', 'Syria', 'Tajikistan', 'Slovakia',
       'Belarus', 'Papua New Guinea', 'Togo', 'Libya', 'Djibouti',
       'Yemen', 'United Arab Emirates', 'Barbados', 'Uzbekistan',
       'Albania', 'Jamaica', 'Uruguay', 'Bolivia',
       'Republic of the Congo', 'Swaziland', 'Kyrgyzstan',
       'Guinea-Bissau', 'Bosnia and Herzegovina', 'Tunisia', 'Armenia',
       'Mali', 'Jordan', 'Trinidad and Tobago', 'Namibia', 'Gabon',
       'Macedonia', 'Nepal', 'Mauritania', 'Guadeloupe', 'Sri Lanka',
       'Chad', 'Eritrea', 'Bahrain', 'Equatorial Guinea', 'Slovenia',
       'Montenegro'], dtype=object)
```

In [40]:
```
df7 = df1.groupby("country")["sales"].count().sort_values(ascending=False).hea
df8 = df7.reset_index()
df8
```

Out[40]:

	country	sales
0	United States	9523
1	France	2626
2	Australia	2623
3	Mexico	2514
4	Germany	1928
5	China	1696
6	Brazil	1530
7	United Kingdom	1512
8	India	1411
9	Turkey	1367

Look for Top 10 Consumer Countries is contributing in profit of supermarket

In [41]:
```
df9 = df1.groupby("country")["profit"].sum().sort_values(ascending=False).head
df9
```

Out[41]:

	country	profit
0	United States	138292.93160
1	China	85736.15100
2	France	71152.04250
3	Germany	67514.97150
4	India	67316.68500
5	Mexico	67190.97832
6	United Kingdom	56649.52500
7	Australia	51011.63100
8	Spain	30682.19700
9	El Salvador	30367.47532

What are the Top 3 Consumer Countries orders as per Segment & Category?

In [42]:
```
df1.columns
```

Out[42]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [43]:
```
df1["segment"].unique()
```

Out[43]:
```
array(['Consumer', 'Home Office', 'Corporate'], dtype=object)
```

In [44]:
```
df1["category"].unique()
```

Out[44]:
```
array(['Office Supplies', 'Furniture', 'Technology'], dtype=object)
```

In [45]:

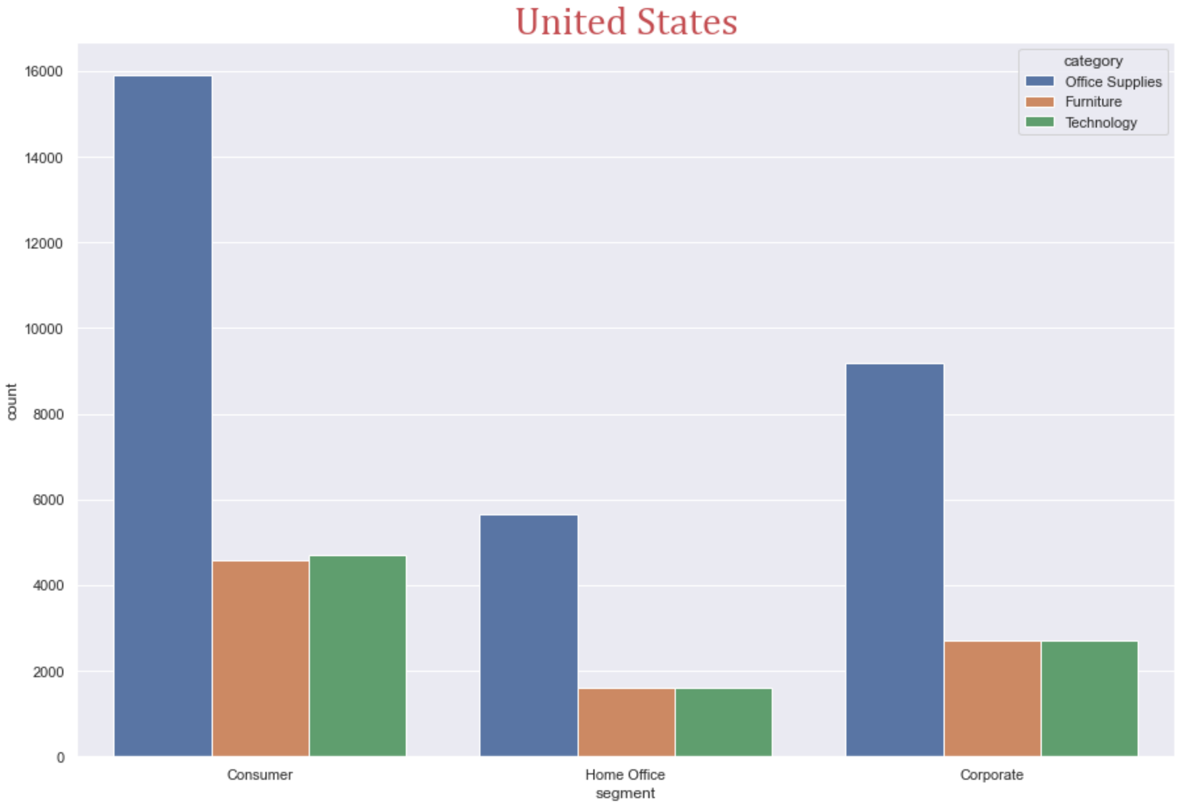
```
df9 = df1["country"].value_counts().head(3).reset_index().rename(columns = {"i
                                                                             "co
df9
```

Out[45]:

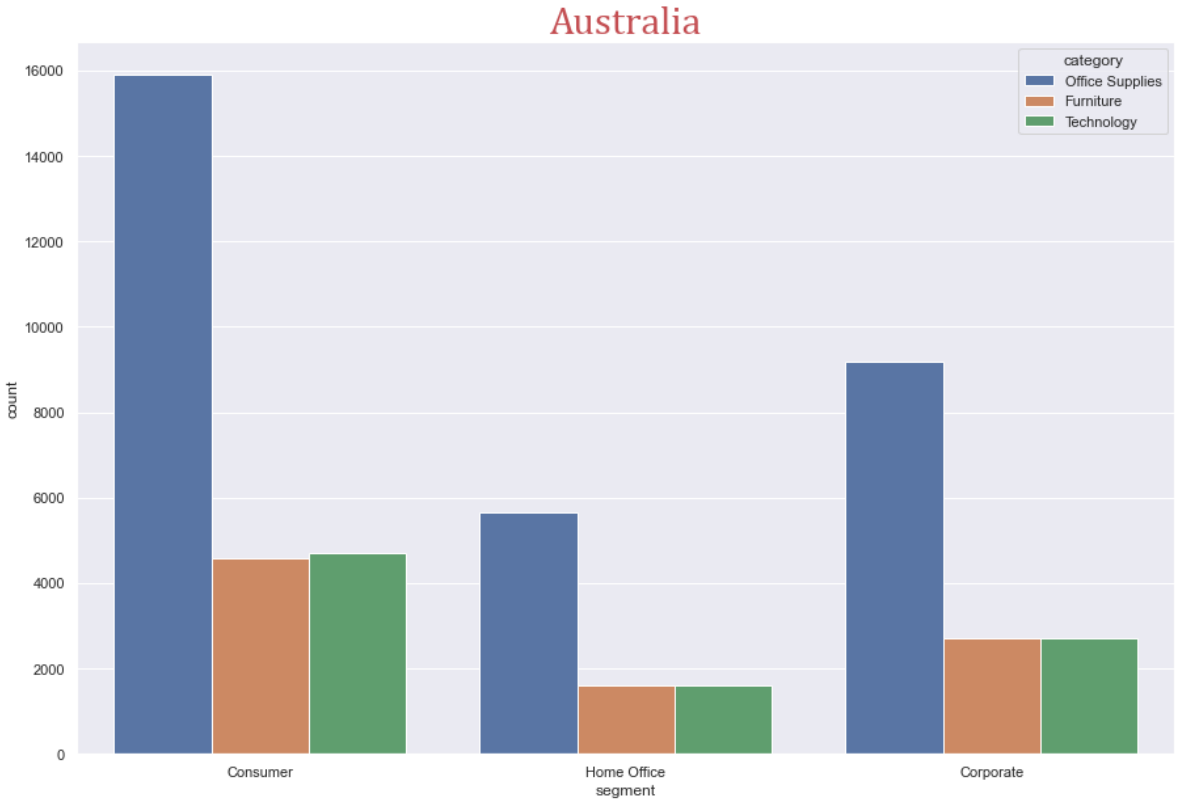
	country	count_sales
0	United States	9523
1	France	2626
2	Australia	2623

In [46]:

```
plt.figure(figsize=(15,10))
plt.title("United States",fontdict=f1)
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["category"])
plt.show()
```

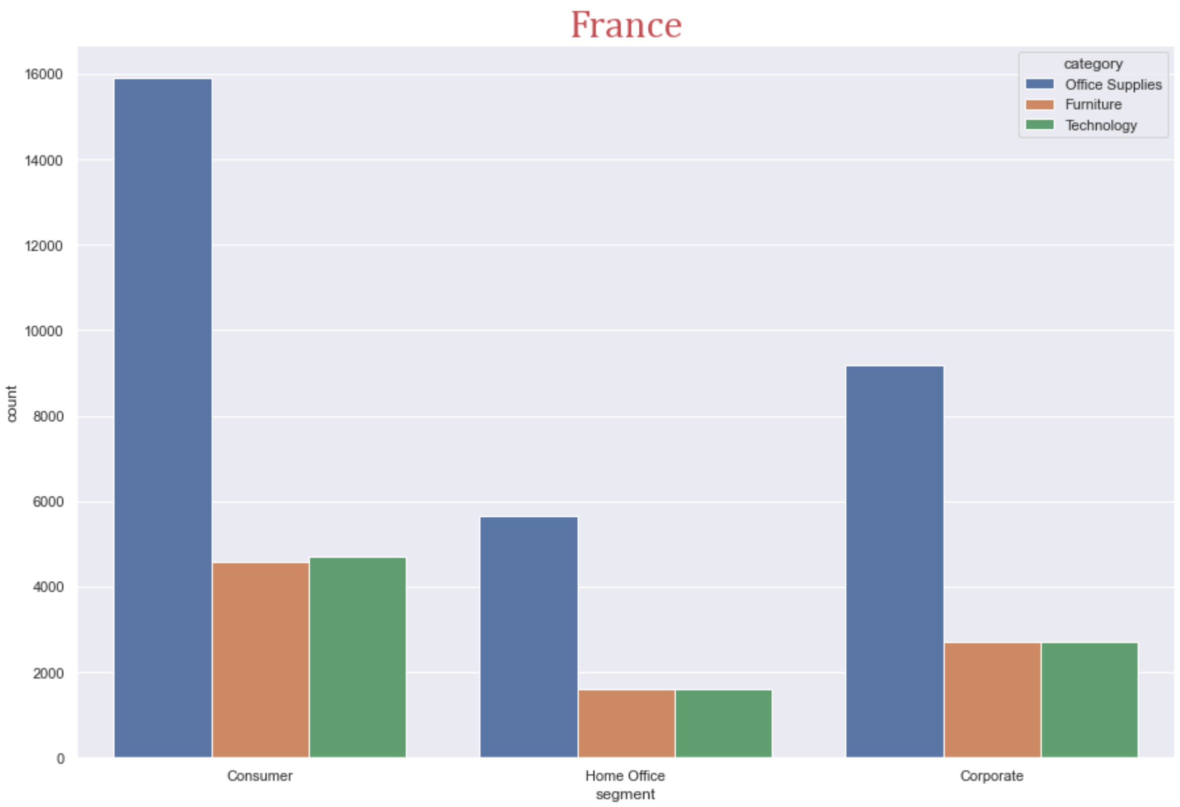


In [47]:
```
plt.figure(figsize=(15,10))
plt.title("Australia",fontdict=f1)
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["category"])
plt.show()
```



Australia

In [48]:
```
plt.figure(figsize=(15,10))
plt.title("France",fontdict=f1)
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["category"])
plt.show()
```



Growth of Superstore Sales over the year 2011-2014?¶

In [49]:
```
df1.columns
```

Out[49]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [50]:
```
df1["year"].unique()
```

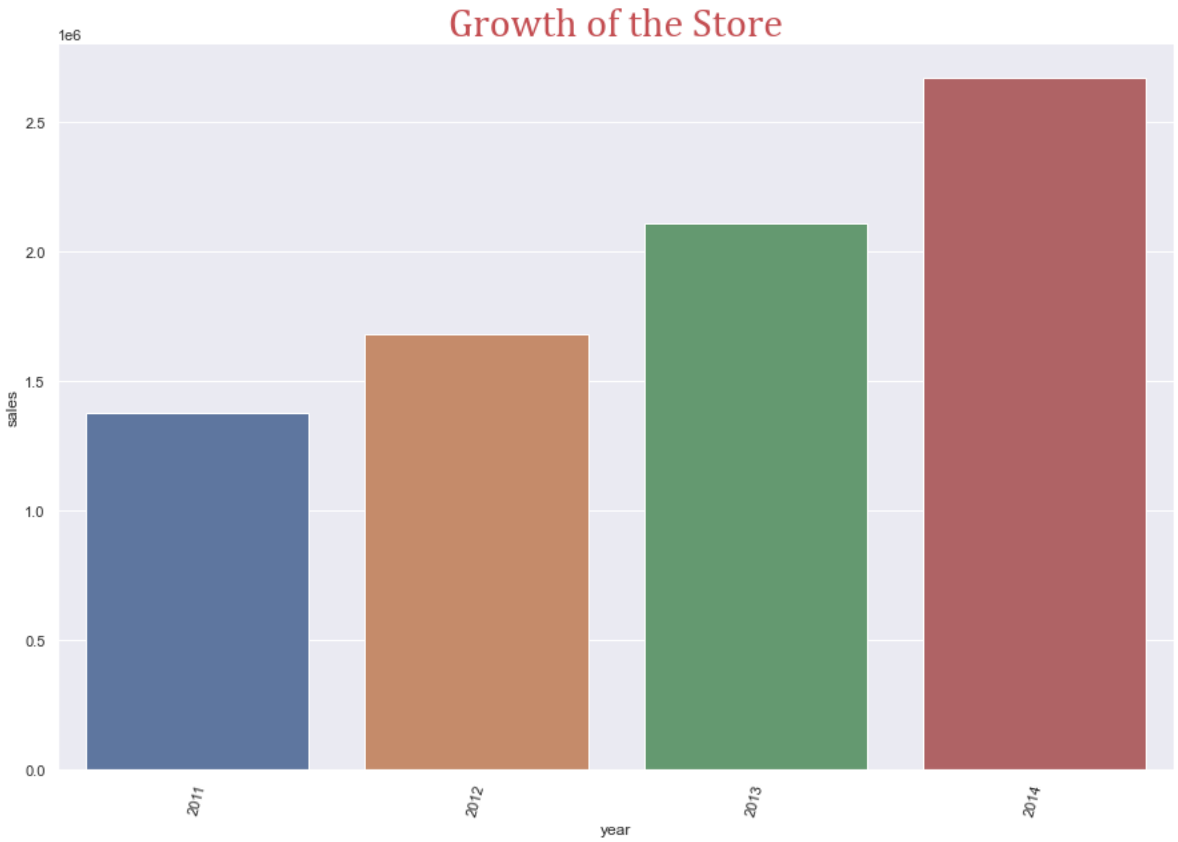
Out[50]:
```
array([2011, 2012, 2013, 2014], dtype=int64)
```

In [51]:
```
df11 = df1.groupby("year")["sales"].sum().reset_index()
df11
```

Out[51]:

	year	sales
0	2011	1378151.0
1	2012	1681499.0
2	2013	2107021.0
3	2014	2668457.0

In [52]:
```
plt.figure(figsize=(15,10))
sns.barplot(x = "year", y = "sales", data= df11,saturation=0.65)
plt.xticks(rotation = 75)
plt.title("Growth of the Store",fontdict=f1)
plt.show()
```



Growth of Superstore quantity over the year 2011-2014?¶

```
In [53]: df1.columns
```

```
Out[53]: Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
                'segment', 'state', 'country', 'market', 'region', 'product_id',
                'category', 'sub_category', 'product_name', 'sales', 'quantity',
                'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
               dtype='object')
```

```
In [54]: df1["year"].unique()
```

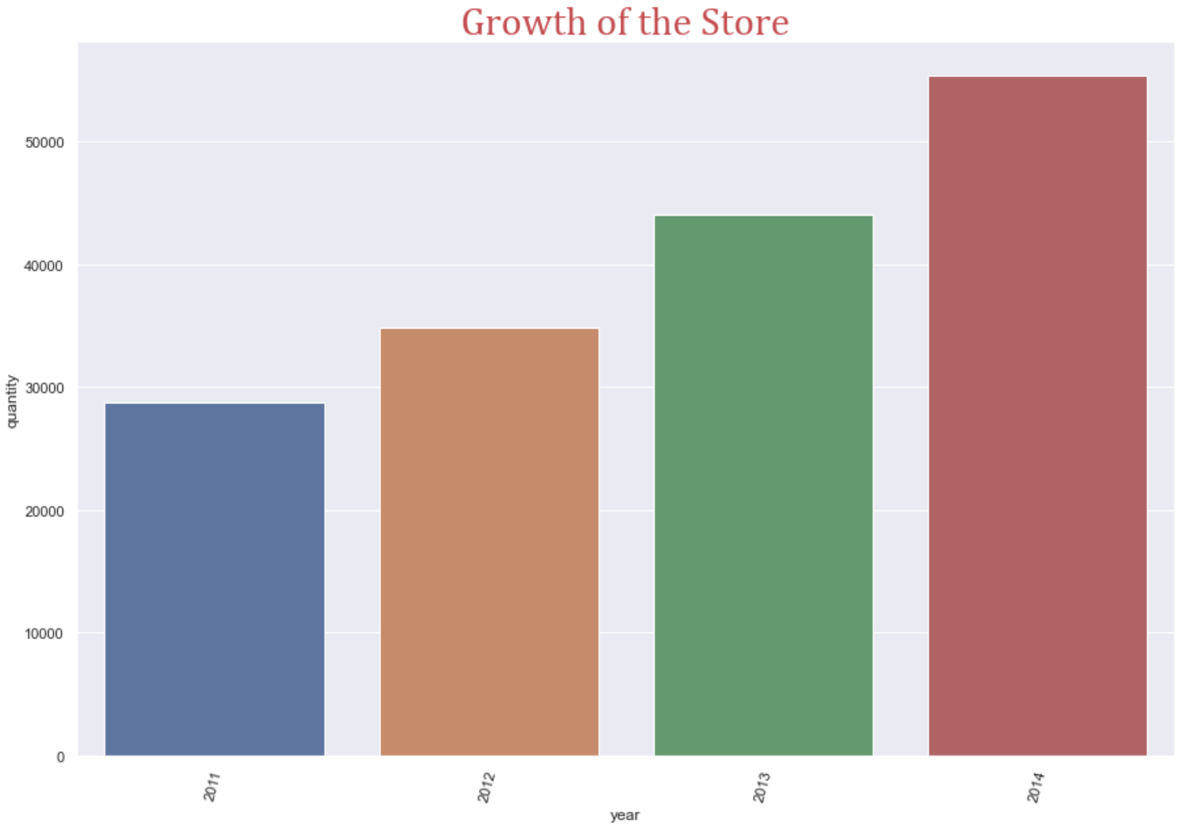
```
Out[54]: array([2011, 2012, 2013, 2014], dtype=int64)
```

```
In [55]: df12 = df1.groupby("year")["quantity"].sum().reset_index()
         df12
```

Out[55]:

	year	quantity
0	2011	28763
1	2012	34899
2	2013	44041
3	2014	55340

```
In [56]: plt.figure(figsize=(15,10))
         sns.barplot(x = "year", y = "quantity", data= df12,saturation=0.65)
         plt.xticks(rotation = 75)
         plt.title("Growth of the Store",fontdict=f1)
         plt.show()
```



Analyzing Profit category and sub_category wise

In [57]:
```
df1.columns
```

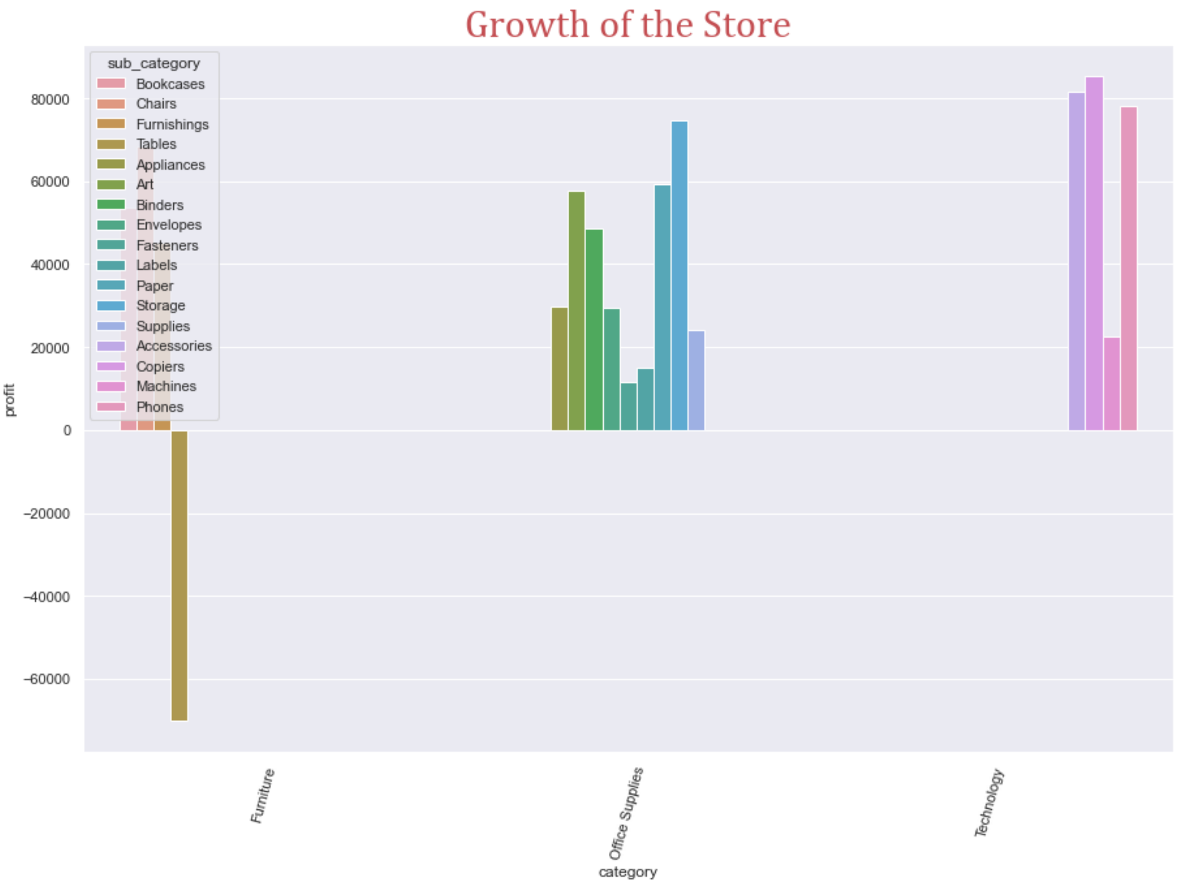
Out[57]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [58]:
```
df13 = df1.groupby(["category","sub_category"])["profit"].sum().reset_index()
df13
```

Out[58]:

	category	sub_category	profit
0	Furniture	Bookcases	53580.68990
1	Furniture	Chairs	68377.74450
2	Furniture	Furnishings	45012.21550
3	Furniture	Tables	-69921.27200
4	Office Supplies	Appliances	29702.84570
5	Office Supplies	Art	57842.60850
6	Office Supplies	Binders	48538.11600
7	Office Supplies	Envelopes	29601.11630
8	Office Supplies	Fasteners	11525.42410
9	Office Supplies	Labels	15010.51200
10	Office Supplies	Paper	59207.68270
11	Office Supplies	Storage	74684.47350
12	Office Supplies	Supplies	23994.54570
13	Technology	Accessories	81507.85580
14	Technology	Copiers	85220.44908
15	Technology	Machines	22674.96240
16	Technology	Phones	78170.20510

```
In [59]: plt.figure(figsize=(15,10))
         sns.barplot(x = "category", y = "profit", data= df13,saturation=0.65, hue = "s
         plt.xticks(rotation = 75)
         plt.title("Growth of the Store",fontdict=f1)
         plt.show()
```



Analyzing Profit from each Market in the World

```
In [60]: df1.columns
```

```
Out[60]: Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
                'segment', 'state', 'country', 'market', 'region', 'product_id',
                'category', 'sub_category', 'product_name', 'sales', 'quantity',
                'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
               dtype='object')
```

```
In [61]: df1["market"].unique()
```

```
Out[61]: array(['Africa', 'APAC', 'EMEA', 'EU', 'Canada', 'LATAM', 'US'],
               dtype=object)
```

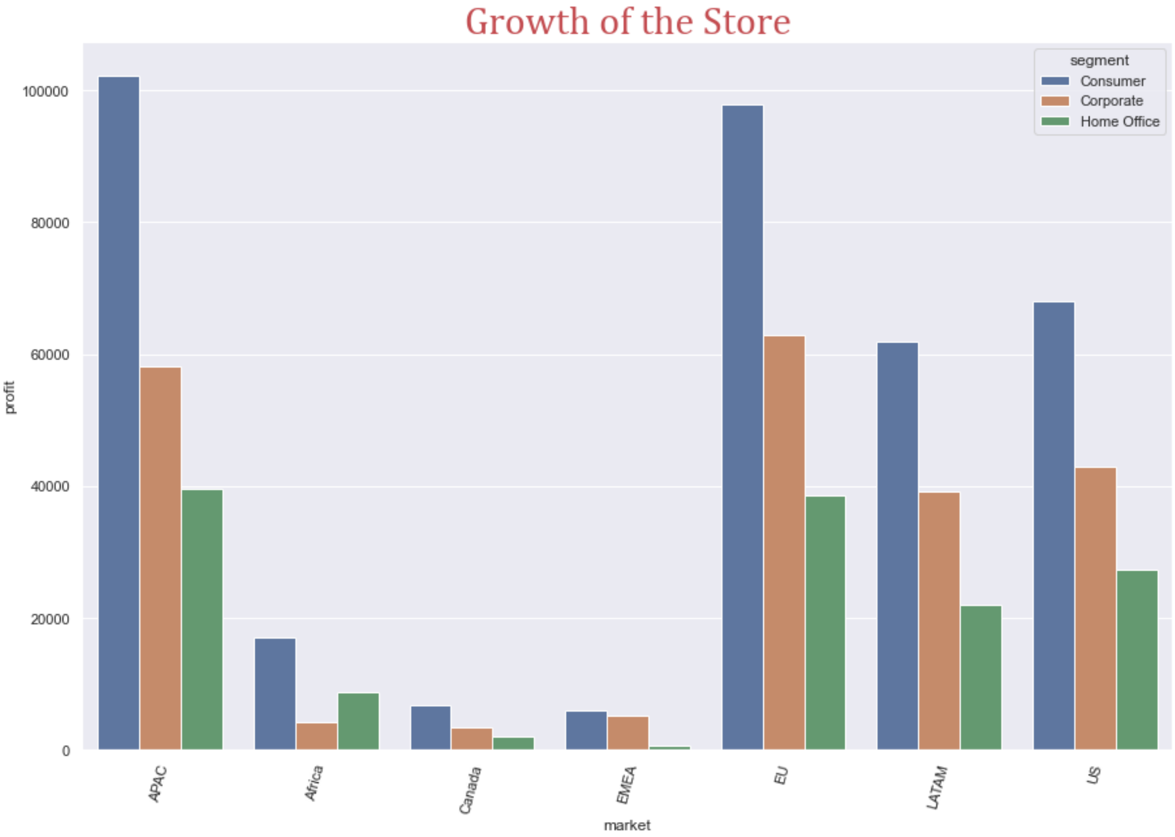
In [62]:

```
df14 = df1.groupby(["segment","market"])["profit"].sum().reset_index()
df14
```

Out[62]:

	segment	market	profit
0	Consumer	APAC	102256.62970
1	Consumer	Africa	17075.41500
2	Consumer	Canada	6865.14000
3	Consumer	EMEA	5981.83800
4	Consumer	EU	97761.50400
5	Consumer	LATAM	61972.67200
6	Consumer	US	68011.96000
7	Corporate	APAC	58161.73990
8	Corporate	Africa	4210.48500
9	Corporate	Canada	3476.58000
10	Corporate	EMEA	5179.33800
11	Corporate	EU	62801.42550
12	Corporate	LATAM	39195.83224
13	Corporate	US	43021.94230
14	Home Office	APAC	39489.08130
15	Home Office	Africa	8854.71900
16	Home Office	Canada	1990.83000
17	Home Office	EMEA	649.08300
18	Home Office	EU	38608.56450
19	Home Office	LATAM	21906.36604
20	Home Office	US	27259.02930

In [63]:
```
plt.figure(figsize=(15,10))
sns.barplot(x = "market", y = "profit", data= df14,saturation=0.65, hue = "seg
plt.xticks(rotation = 75)
plt.title("Growth of the Store",fontdict=f1)
plt.show()
```



Analyzing sales from each Market in the World

In [64]:
```
df1.columns
```

Out[64]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [65]:

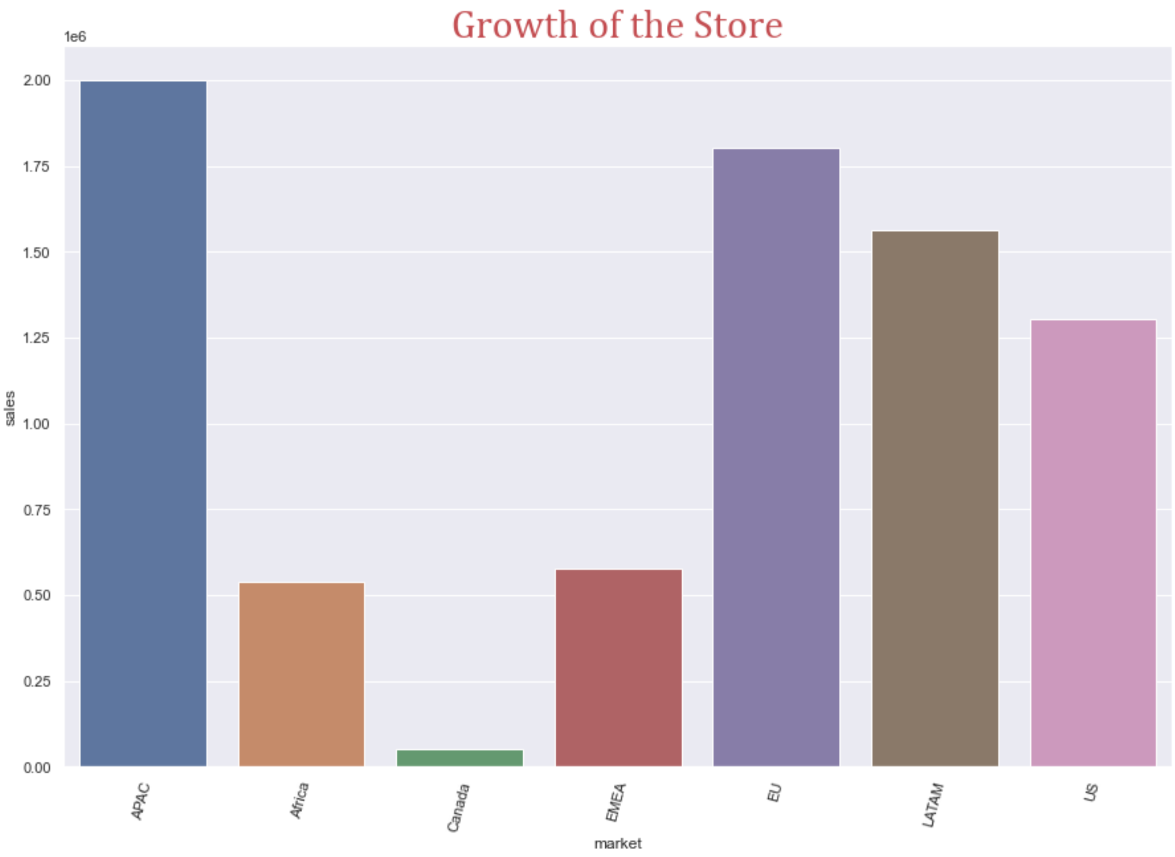
```
df14 = df1.groupby("market")["sales"].sum().reset_index()
df14
```

Out[65]:

	market	sales
0	APAC	2000746.0
1	Africa	538115.0
2	Canada	50314.0
3	EMEA	575562.0
4	EU	1803099.0
5	LATAM	1563126.0
6	US	1304166.0

In [66]:

```
plt.figure(figsize=(15,10))
sns.barplot(x = "market", y = "sales", data= df14,saturation=0.65)
plt.xticks(rotation = 75)
plt.title("Growth of the Store",fontdict=f1)
plt.show()
```



Top 5 Profitable Countries?

In [67]:
```
df1.columns
```

Out[67]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [68]:
```
df1["country"].unique()
```

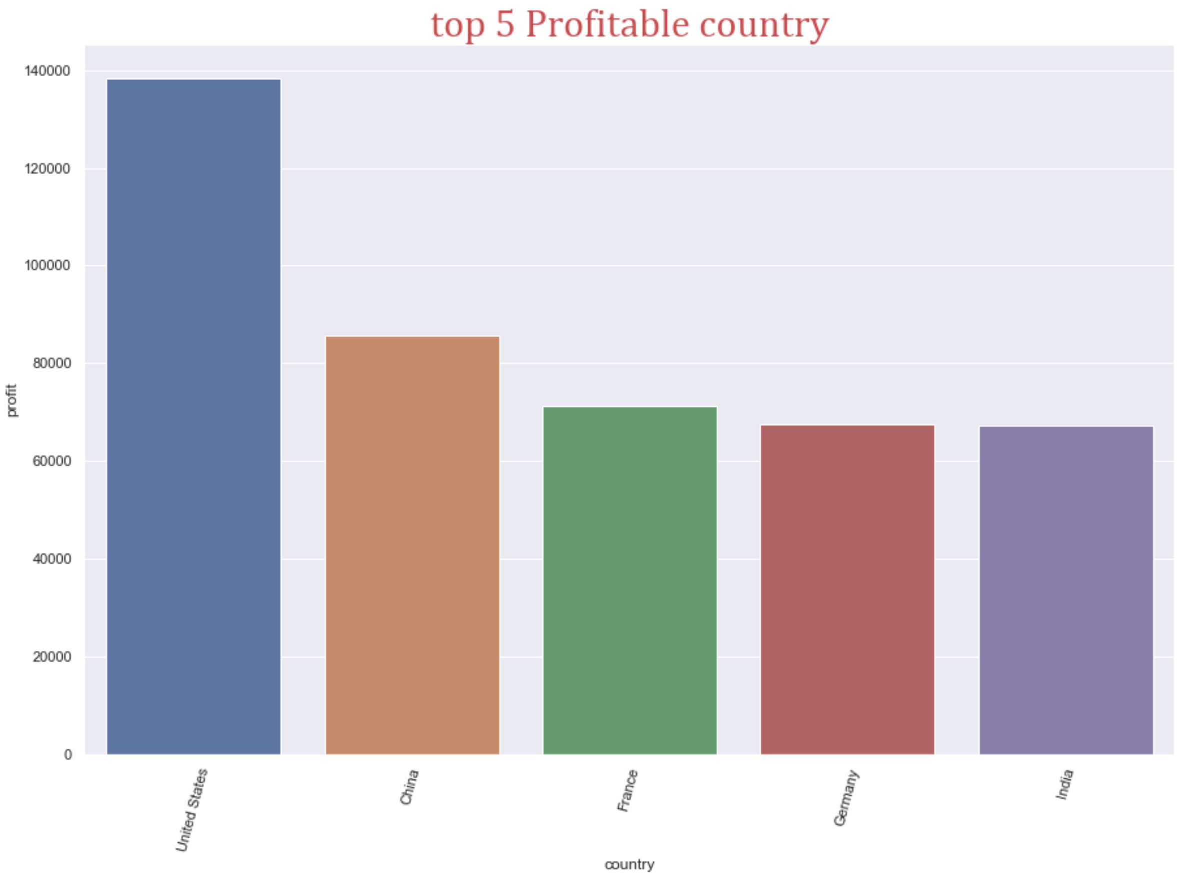
Out[68]:
```
array(['Algeria', 'Australia', 'Hungary', 'Sweden', 'Canada',
       'New Zealand', 'Iraq', 'Philippines', 'United Kingdom', 'Malaysia',
       'Guatemala', 'Iran', 'Thailand', 'Tanzania', 'Mexico', 'Cuba',
       'France', 'Brazil', 'United States', 'Japan', 'Sudan', 'Taiwan',
       'Indonesia', 'Vietnam', 'Angola', 'China', 'Mozambique', 'Lebanon',
       'Singapore', 'Netherlands', 'Nigeria', 'Egypt', 'Venezuela',
       'South Africa', 'Spain', 'India', 'Turkey', 'Austria', 'Italy',
       'Germany', 'Nicaragua', 'Dominican Republic', 'Denmark',
       'Saudi Arabia', 'Zambia', 'Myanmar (Burma)', 'Russia', 'Mongolia',
       'Belgium', 'Kenya', 'El Salvador', 'Colombia', 'Estonia',
       'Madagascar', 'Portugal', 'Morocco', 'Sierra Leone', 'Norway',
       'Central African Republic', 'Czech Republic', 'Benin',
       'Bangladesh', 'Panama', 'Chile', 'South Korea', 'Switzerland',
       'Moldova', 'Uganda', 'Zimbabwe', 'Niger', 'Senegal', 'Hong Kong',
       'Democratic Republic of the Congo', 'Poland', 'Ireland',
       'Pakistan', 'Azerbaijan', 'Ukraine', 'Romania', 'Honduras',
       'Israel', 'Cameroon', 'Cambodia', 'Georgia', 'Argentina',
       'Finland', 'Lithuania', 'Peru', 'Somalia', 'Haiti',
       "Cote d'Ivoire", 'Afghanistan', 'Guinea', 'Liberia', 'South Sudan',
       'Turkmenistan', 'Kazakhstan', 'Lesotho', 'Burundi', 'Qatar',
       'Bulgaria', 'Martinique', 'Croatia', 'Ghana', 'Rwanda', 'Ecuador',
       'Paraguay', 'Ethiopia', 'Syria', 'Tajikistan', 'Slovakia',
       'Belarus', 'Papua New Guinea', 'Togo', 'Libya', 'Djibouti',
       'Yemen', 'United Arab Emirates', 'Barbados', 'Uzbekistan',
       'Albania', 'Jamaica', 'Uruguay', 'Bolivia',
       'Republic of the Congo', 'Swaziland', 'Kyrgyzstan',
       'Guinea-Bissau', 'Bosnia and Herzegovina', 'Tunisia', 'Armenia',
       'Mali', 'Jordan', 'Trinidad and Tobago', 'Namibia', 'Gabon',
       'Macedonia', 'Nepal', 'Mauritania', 'Guadeloupe', 'Sri Lanka',
       'Chad', 'Eritrea', 'Bahrain', 'Equatorial Guinea', 'Slovenia',
       'Montenegro'], dtype=object)
```

In [69]:
```
df16 = df1.groupby("country")["profit"].sum().sort_values(ascending = False).r
df16
```

Out[69]:

	country	profit
0	United States	138292.9316
1	China	85736.1510
2	France	71152.0425
3	Germany	67514.9715
4	India	67316.6850

In [70]:
```
plt.figure(figsize=(15,10))
sns.barplot(x = "country", y = "profit", data= df16,saturation=0.65)
plt.xticks(rotation = 75)
plt.title("top 5 Profitable country",fontdict=f1)
plt.show()
```



What are the top 10 most selling Products?¶

In [71]:
```
df1.columns
```

Out[71]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [72]:
```
df1["product_name"].nunique()
```

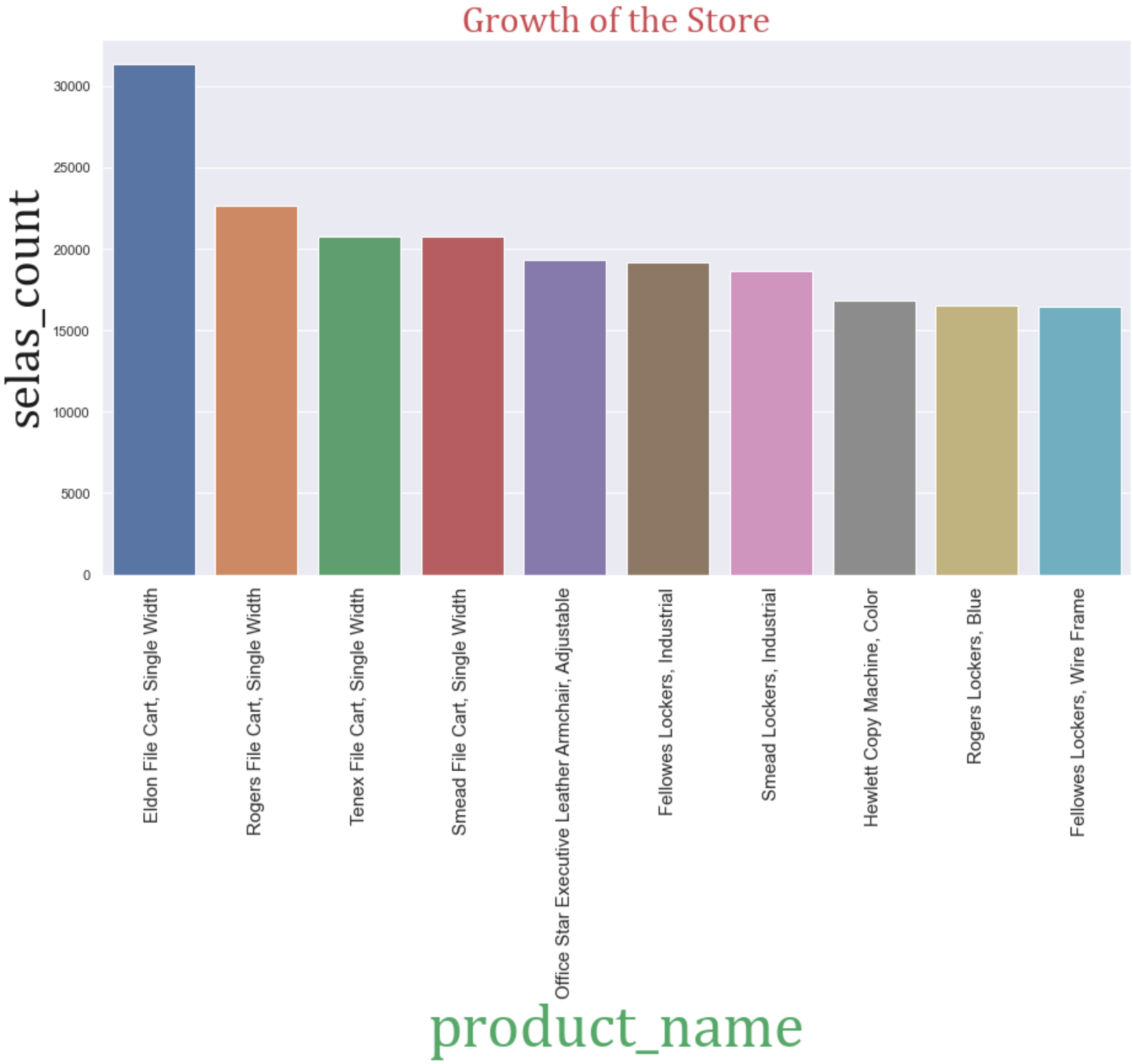
Out[72]:
```
3742
```

In [73]:
```
df17 = df1.groupby("product_name")["sales"].sum().sort_values(ascending = Fals
df17
```

Out[73]:

	product_name	sales
0	Eldon File Cart, Single Width	31319.0
1	Rogers File Cart, Single Width	22645.0
2	Tenex File Cart, Single Width	20778.0
3	Smead File Cart, Single Width	20775.0
4	Office Star Executive Leather Armchair, Adjust...	19355.0
5	Fellowes Lockers, Industrial	19172.0
6	Smead Lockers, Industrial	18648.0
7	Hewlett Copy Machine, Color	16849.0
8	Rogers Lockers, Blue	16494.0
9	Fellowes Lockers, Wire Frame	16470.0

In [74]:
```
plt.figure(figsize=(15,8))
f2 = {"family":"cambria","color":"g","size":50}
f3  = {"family":"cambria","color":"k","size":40}
sns.barplot(x="product_name",y="sales",data = df17)
plt.xlabel("product_name", fontdict=f2)
plt.ylabel("selas_count",fontdict=f3)
plt.title("Growth of the Store",fontdict=f1)
plt.xticks(rotation=90,fontsize = 15)
plt.show()
```



What is the most preferred Shipment Mode? ¶

In [75]:
```
df1.columns
```

Out[75]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [76]:
```
df1["ship_mode"].unique()
```

Out[76]:
```
array(['Standard Class', 'Second Class', 'Same Day', 'First Class'],
      dtype=object)
```

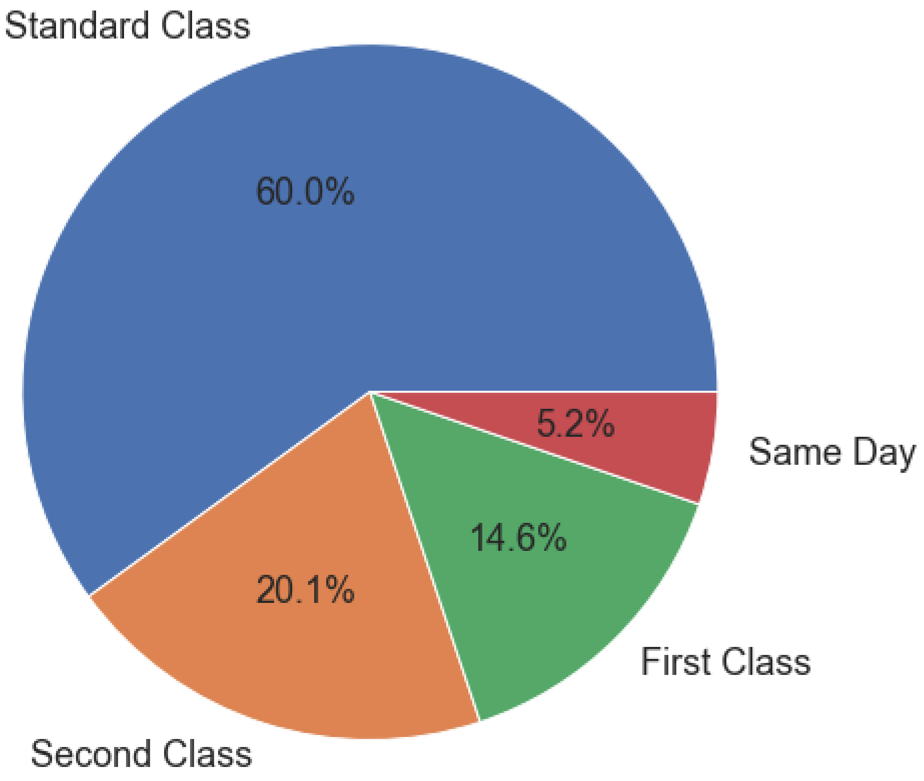
In [77]:
```
df1["ship_mode"].value_counts()
```

Out[77]:
```
Standard Class    29202
Second Class       9789
First Class        7121
Same Day           2548
Name: ship_mode, dtype: int64
```

In [78]:
```
df1["ship_mode"].value_counts().keys()
```

Out[78]:
```
Index(['Standard Class', 'Second Class', 'First Class', 'Same Day'], dtype='o
bject')
```

In [79]:
```
plt.pie(df1["ship_mode"].value_counts(),labels=df1["ship_mode"].value_counts()
plt.show()
```



In which Region the store is giving more discount and what is the most profitable region?¶

In [80]:
```
df1.columns
```

Out[80]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [81]:
```
df1["region"].unique()
```

Out[81]:
```
array(['Africa', 'Oceania', 'EMEA', 'North', 'Canada', 'Southeast Asia',
       'Central', 'Caribbean', 'South', 'North Asia', 'East', 'West',
       'Central Asia'], dtype=object)
```

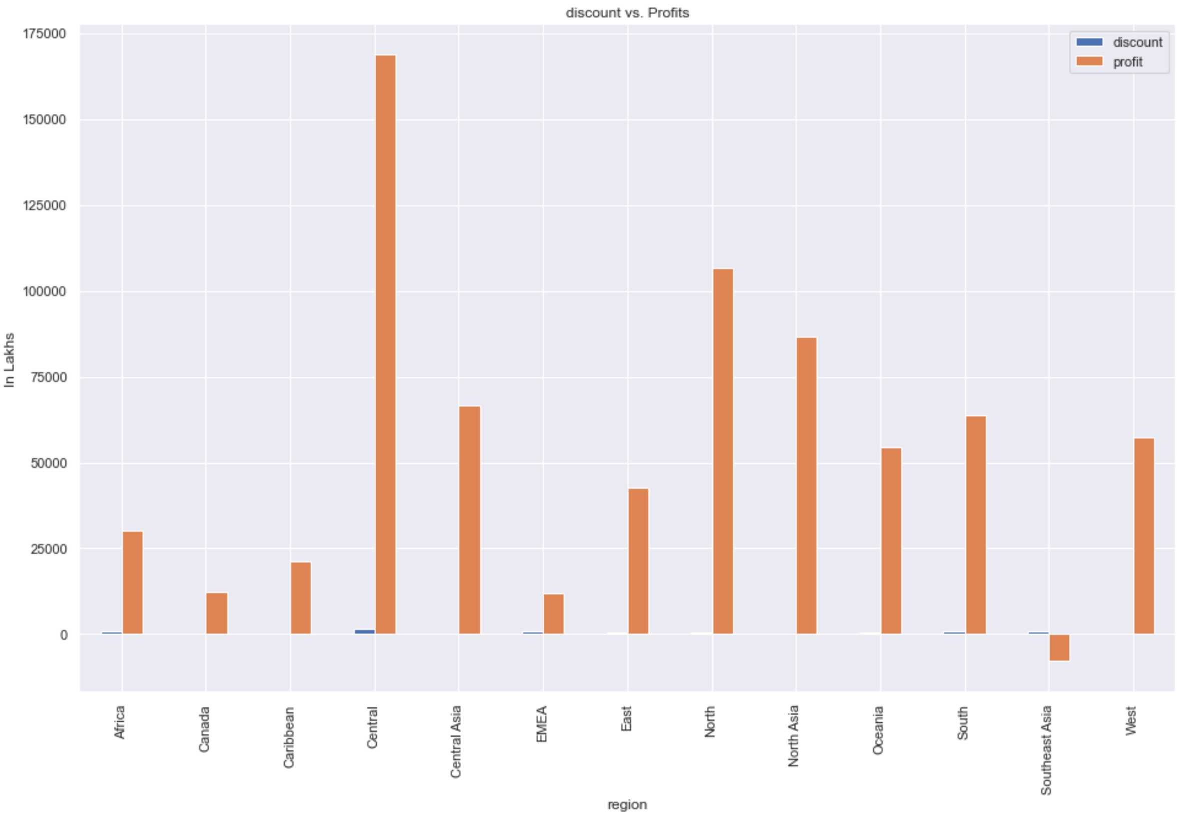
In [82]:
```
df19 = df1.groupby("region")["discount","profit"].sum()
df19
```

Out[82]:

region	discount	profit
Africa	717.100	30140.61900
Canada	0.000	12332.55000
Caribbean	226.606	21379.30896
Central	1479.998	168764.86940
Central Asia	133.500	66450.97000
EMEA	977.700	11810.25900
East	393.300	42644.30580
North	444.272	106622.10832
North Asia	105.400	86676.69300
Oceania	503.700	54548.28600

In [83]:
```
df19.plot(kind='bar',figsize=(16,10))
plt.title("discount vs. Profits")
plt.ylabel("In Lakhs")
```

Out[83]:
```
Text(0, 0.5, 'In Lakhs')
```



Creating only Profit/Loss Dataframe to calculate Total Profit & Loss of the superstore from 2011-2014 and the Net Profit¶

In [84]:

```
df_profit = df1[df1["profit"]>0]
df_profit.head()
```

Out[84]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	country
0	AG-2011-2040	2011-01-01	2011-06-01	Standard Class	Toby Braunhardt	Consumer	Constantine	Algeria
1	IN-2011-47883	2011-01-01	2011-08-01	Standard Class	Joseph Holt	Consumer	New South Wales	Australia
2	HU-2011-1220	2011-01-01	2011-05-01	Second Class	Annie Thurman	Consumer	Budapest	Hungary
4	IN-2011-47883	2011-01-01	2011-08-01	Standard Class	Joseph Holt	Consumer	New South Wales	Australia
5	IN-2011-47883	2011-01-01	2011-08-01	Standard Class	Joseph Holt	Consumer	New South Wales	Australia

5 rows × 21 columns

In [85]:

```
df_loss = df1[df1["profit"]<0]
df_loss.head()
```

Out[85]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	countr
3	IT-2011-3647632	2011-01-01	2011-05-01	Second Class	Eugene Moren	Home Office	Stockholm	Swede
8	ID-2011-80230	2011-03-01	2011-09-01	Standard Class	Ken Lonsdale	Consumer	Auckland	Nev Zealan
10	IN-2011-65159	2011-03-01	2011-07-01	Second Class	Larry Blacks	Consumer	National Capital	Philippine
11	IN-2011-65159	2011-03-01	2011-07-01	Second Class	Larry Blacks	Consumer	National Capital	Philippine
14	ID-2011-80230	2011-03-01	2011-09-01	Standard Class	Ken Lonsdale	Consumer	Auckland	Nev Zealan

5 rows × 21 columns

In [86]:

```
total_profit = df_profit["profit"].sum().round(2)
total_profit
```

Out[86]:

```
1425420.41
```

In [87]:

```
total_loss = df_loss["profit"].sum().round(2)
total_loss
```

Out[87]:

```
-710690.23
```

In [88]:

```
net_worth =total_profit - total_loss
net_worth.round(2)
```

Out[88]:

```
2136110.64
```

In [89]:

```
df_net_profit = pd.DataFrame({"total_profit" : {0:1425420.41},
                              "total_loss" : {0:710690.23},
                              "net_worth":{0:714730.18}})
```

In [90]:

```
df_net_profit
```

Out[90]:

	total_profit	total_loss	net_worth
0	1425420.41	710690.23	714730.18

Find weighted avarage sales by region

In [91]:

```
df1.columns
```

Out[91]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [92]:
```
df_sales = df1.groupby("region")["sales"].sum().reset_index()
df_sales
```

Out[92]:

	region	sales
0	Africa	538115.0
1	Canada	50314.0
2	Caribbean	251441.0
3	Central	1806638.0
4	Central Asia	389506.0
5	EMEA	575562.0
6	East	366492.0
7	North	790546.0
8	North Asia	453686.0
9	Oceania	625382.0
10	South	1031101.0
11	Southeast Asia	532172.0
12	West	424173.0

In [93]:
```
df_count = df1.groupby("region")["sales"].count().reset_index().rename(columns
df_count
```

Out[93]:

	region	freq
0	Africa	4448
1	Canada	375
2	Caribbean	1643
3	Central	10543
4	Central Asia	1867
5	EMEA	4891
6	East	2705
7	North	4520
8	North Asia	2121
9	Oceania	3238
10	South	6340
11	Southeast Asia	2926
12	West	3043

In [94]:
```
df_wt = df_sales.merge(df_count,on = "region")
df_wt
```

Out[94]:

	region	sales	freq
0	Africa	538115.0	4448
1	Canada	50314.0	375
2	Caribbean	251441.0	1643
3	Central	1806638.0	10543
4	Central Asia	389506.0	1867
5	EMEA	575562.0	4891
6	East	366492.0	2705
7	North	790546.0	4520
8	North Asia	453686.0	2121
9	Oceania	625382.0	3238
10	South	1031101.0	6340
11	Southeast Asia	532172.0	2926
12	West	424173.0	3043

In [95]:
```
df_wt["fre_SUM"] = df_wt.sales * df_wt.freq
```

In [96]:
```
df_wt
```

Out[96]:

	region	sales	freq	fre_SUM
0	Africa	538115.0	4448	2.393536e+09
1	Canada	50314.0	375	1.886775e+07
2	Caribbean	251441.0	1643	4.131176e+08
3	Central	1806638.0	10543	1.904738e+10
4	Central Asia	389506.0	1867	7.272077e+08
5	EMEA	575562.0	4891	2.815074e+09
6	East	366492.0	2705	9.913609e+08
7	North	790546.0	4520	3.573268e+09
8	North Asia	453686.0	2121	9.622680e+08
9	Oceania	625382.0	3238	2.024987e+09
10	South	1031101.0	6340	6.537180e+09
11	Southeast Asia	532172.0	2926	1.557135e+09
12	West	424173.0	3043	1.290758e+09

```
In [97]: weight_avg = df_wt.fre_SUM.sum() / df_wt.freq.sum()
         weight_avg
```

```
Out[97]: 870368.7723797781
```

state wise profit of supermarket

```
In [98]: df1.columns
```

```
Out[98]: Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
                'segment', 'state', 'country', 'market', 'region', 'product_id',
                'category', 'sub_category', 'product_name', 'sales', 'quantity',
                'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
               dtype='object')
```

```
In [99]: df1["state"].nunique()
```

```
Out[99]: 1088
```

```
In [100]: df21 = df1.groupby("state")[["profit","sales"]].sum()
          df22 = df21.sort_values(by = "profit",ascending=False)
          df22.head(10)
```

Out[100]:

	profit	sales
state		
England	49869.90600	273710.0
California	48342.49910	270615.0
New York	33118.39490	153366.0
Ile-de-France	29976.85800	188108.0
North Rhine-Westphalia	27066.12600	135097.0
San Salvador	25632.30912	105245.0
New South Wales	24131.54100	145380.0
Managua	14877.19724	59055.0
São Paulo	14736.37324	70388.0
Guatemala	14736.27248	69372.0

country wise profit of supermarket

In [101]:
```
df1.columns
```

Out[101]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [102]:
```
df1["country"].nunique()
```

Out[102]:
```
147
```

In [103]:
```
df23 = df1.groupby("country")[["profit","sales"]].sum()
df24 = df23.sort_values(by = "profit",ascending=False)
df24.head(10)
```

Out[103]:

	profit	sales
country		
United States	138292.93160	1304166.0
China	85736.15100	368852.0
France	71152.04250	526745.0
Germany	67514.97150	389320.0
India	67316.68500	302511.0
Mexico	67190.97832	416083.0
United Kingdom	56649.52500	300040.0
Australia	51011.63100	516624.0
Spain	30682.19700	165619.0
El Salvador	30367.47532	123814.0

check state wise loss of supermarket

In [104]:
```
df22.head()
```

Out[104]:

	profit	sales
state		
England	49869.9060	273710.0
California	48342.4991	270615.0
New York	33118.3949	153366.0
Ile-de-France	29976.8580	188108.0
North Rhine-Westphalia	27066.1260	135097.0

In [105]:

```
df25 = df22["profit"]<0
```

In [106]:

```
df25_loss = df22[df22["profit"]<0]
df25_loss.head(10)
```

Out[106]:

	profit	sales
state		
Táchira	-0.5400	33.0
Ayacucho	-1.3160	609.0
Cojedes	-3.3400	114.0
T?nh C?n Th?	-4.4103	1983.0
Matabeleland North	-5.3250	3.0
Kabarole	-5.4870	4.0
Lambayeque	-8.4240	32.0
Ardahan	-10.7760	36.0
Setúbal	-11.0250	182.0
Ruvuma	-12.2040	273.0

country wise loss of supermarket

In [107]:

```
df24.head()
```

Out[107]:

	profit	sales
country		
United States	138292.9316	1304166.0
China	85736.1510	368852.0
France	71152.0425	526745.0
Germany	67514.9715	389320.0
India	67316.6850	302511.0

In [108]:

```
df26 = df24[df24["profit"]<0]
df26
```

Out[108]:

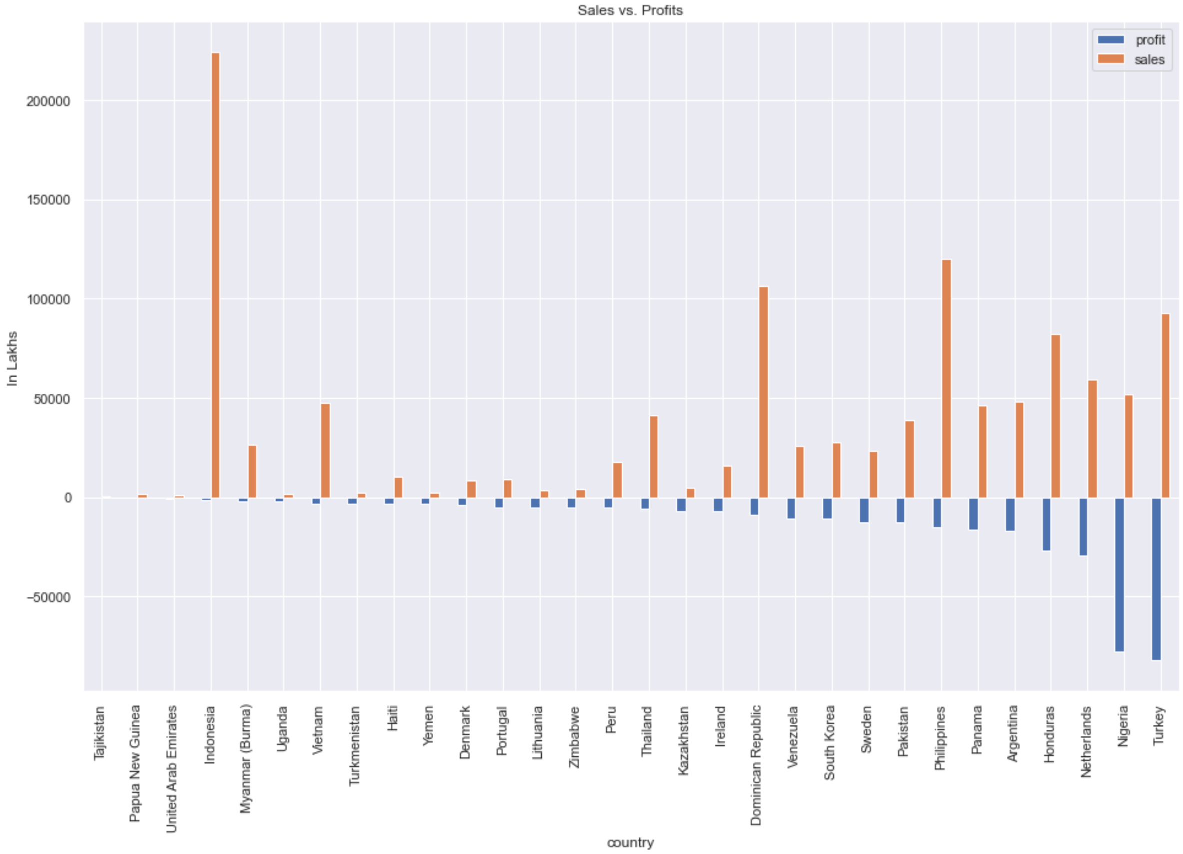
country	profit	sales
Tajikistan	-262.86600	242.0
Papua New Guinea	-475.62900	1786.0
United Arab Emirates	-1036.86000	742.0
Indonesia	-1336.08380	224180.0
Myanmar (Burma)	-1864.07490	26341.0
Uganda	-2426.08500	1625.0
Vietnam	-3290.15730	47572.0
Turkmenistan	-3302.70900	2029.0
Haiti	-3659.76300	9945.0
Yemen	-3706.45800	2464.0
Denmark	-4282.04700	8643.0
Portugal	-4967.91000	9106.0
Lithuania	-5043.10200	3379.0
Zimbabwe	-5428.78500	3767.0
Peru	-5507.87628	17834.0
Thailand	-5896.38060	41102.0
Kazakhstan	-7099.89600	4602.0
Ireland	-7145.25600	15609.0
Dominican Republic	-8678.08072	106487.0
Venezuela	-10906.43044	25533.0
South Korea	-11029.62300	27418.0
Sweden	-12454.48200	23420.0
Pakistan	-12491.14500	38967.0
Philippines	-15257.16150	120135.0
Panama	-16619.58048	46257.0
Argentina	-17084.62872	47783.0
Honduras	-26956.24836	82109.0
Netherlands	-29391.09000	59377.0
Nigeria	-77615.74200	51552.0
Turkey	-82359.08400	92522.0

In [109]:
```
df26.shape
```

Out[109]:
```
(30, 2)
```

In [110]:
```
df26.plot(kind='bar',figsize=(16,10))
plt.title("Sales vs. Profits")
plt.ylabel("In Lakhs")
```

Out[110]:
```
Text(0, 0.5, 'In Lakhs')
```



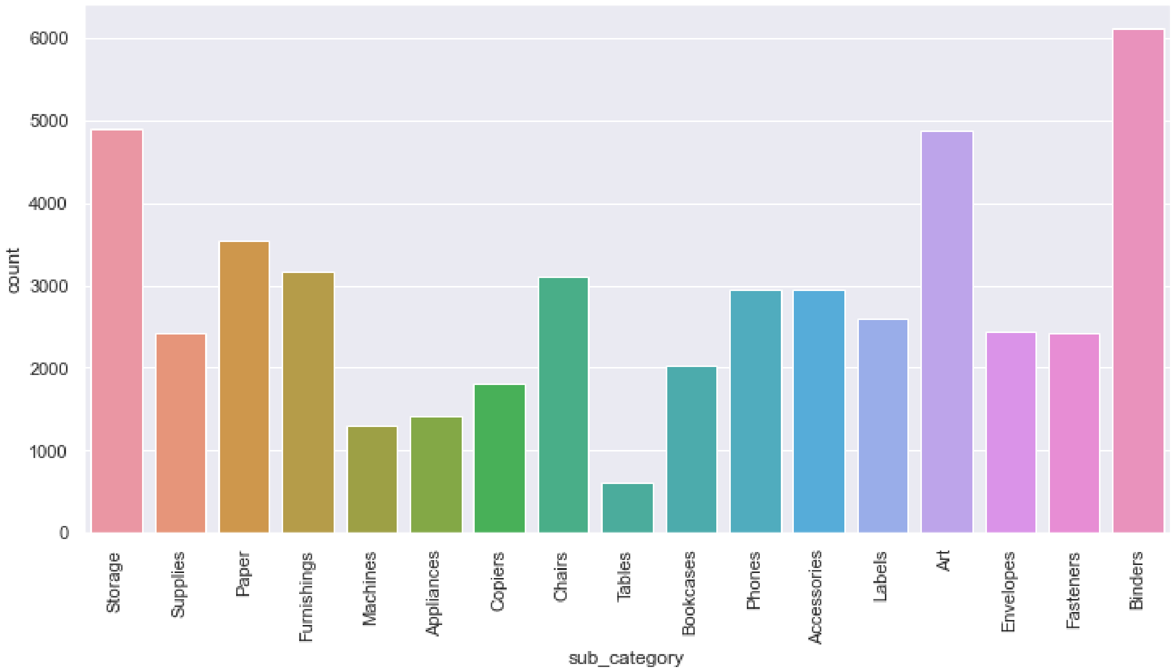
What are the Highest selling and Lowest Selling Sub-Category?¶

In [111]:
```
df1.columns
```

Out[111]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [112]:

```
plt.figure(figsize=(12,6))
sns.countplot(x=df1['sub_category'])
plt.xticks(rotation=90)
plt.show()
```



Analyzing the product needs of Top 10 countries as per Coustomer Segment¶

In [113]:

```
df1.columns
```

Out[113]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [114]:

```
df1["segment"].unique()
```

Out[114]:

```
array(['Consumer', 'Home Office', 'Corporate'], dtype=object)
```

In [115]:
```
df27 = df1["country"].value_counts().head(10)
df27
```

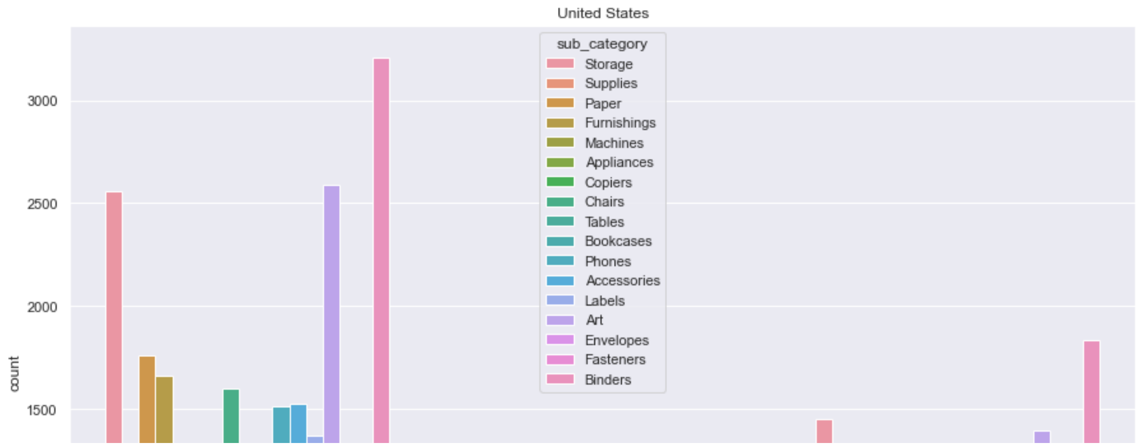
Out[115]:
```
United States     9523
France            2626
Australia         2623
Mexico            2514
Germany           1928
China             1696
Brazil            1530
United Kingdom    1512
India             1411
Turkey            1367
Name: country, dtype: int64
```

In [116]:

```
#Products by Categories consumed by Top 10 countries
plt.figure(figsize=(15,10))
plt.title("United States")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("Australia")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("France")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("Mexico")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("Germany")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("China")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("Brazil")
sns.set_theme(style="darkgrid")
sns.countplot(x = df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("United States")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("India")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
##################################
plt.figure(figsize=(15,10))
plt.title("Indonesia")
sns.set_theme(style="darkgrid")
sns.countplot(x=df1["segment"],hue=df1["sub_category"])
```

Out[116]:

```
<AxesSubplot:title={'center':'Indonesia'}, xlabel='segment', ylabel='coun
t'>
```



year wise SALES vs. PROFITS¶

In [117]:
```
df1["year"].unique()
```

Out[117]:
```
array([2011, 2012, 2013, 2014], dtype=int64)
```

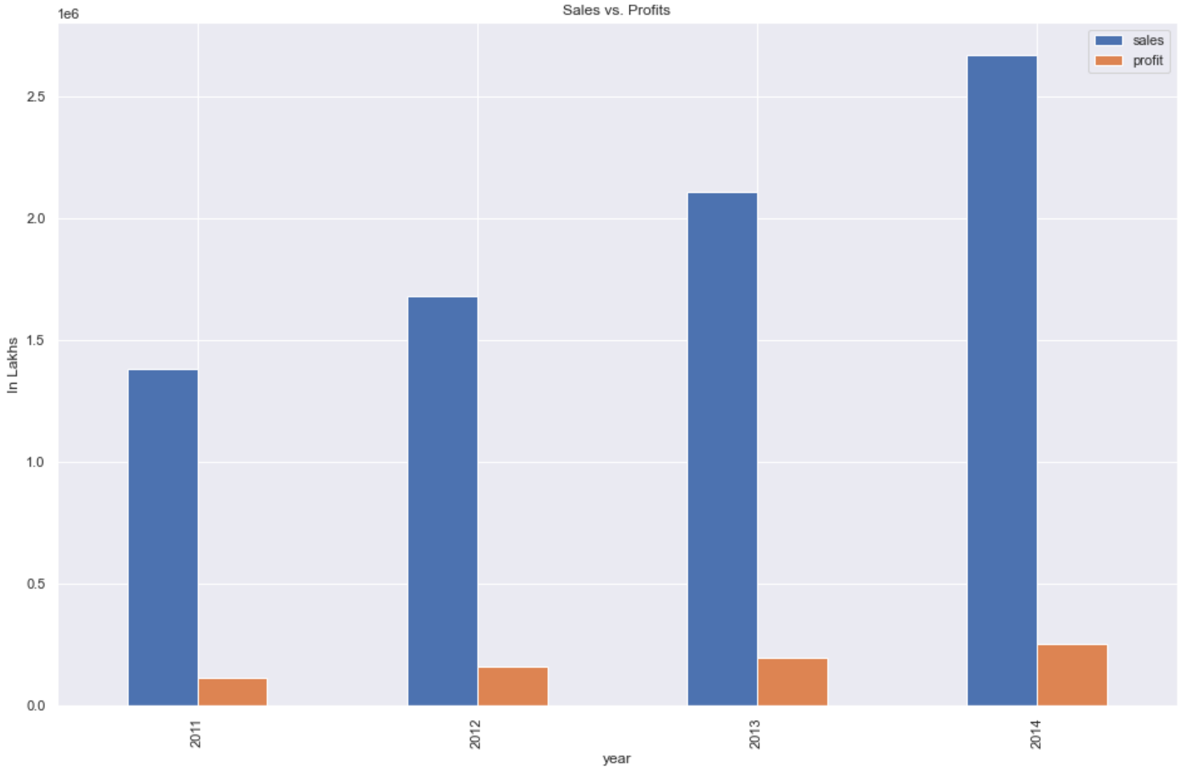
In [118]:
```
df28 = df1.groupby('year')[['sales','profit']].sum()
df28
```

Out[118]:

	sales	profit
year		
2011	1378151.0	112367.33366
2012	1681499.0	157966.74694
2013	2107021.0	194353.15878
2014	2668457.0	250042.93540

In [119]:
```
df28.plot(kind='bar',figsize=(16,10))
plt.title("Sales vs. Profits")
plt.ylabel("In Lakhs")
```

Out[119]:
```
Text(0, 0.5, 'In Lakhs')
```



Analyzing shiping mode for each category in Super-store¶

In [120]:
```
df1.columns
```

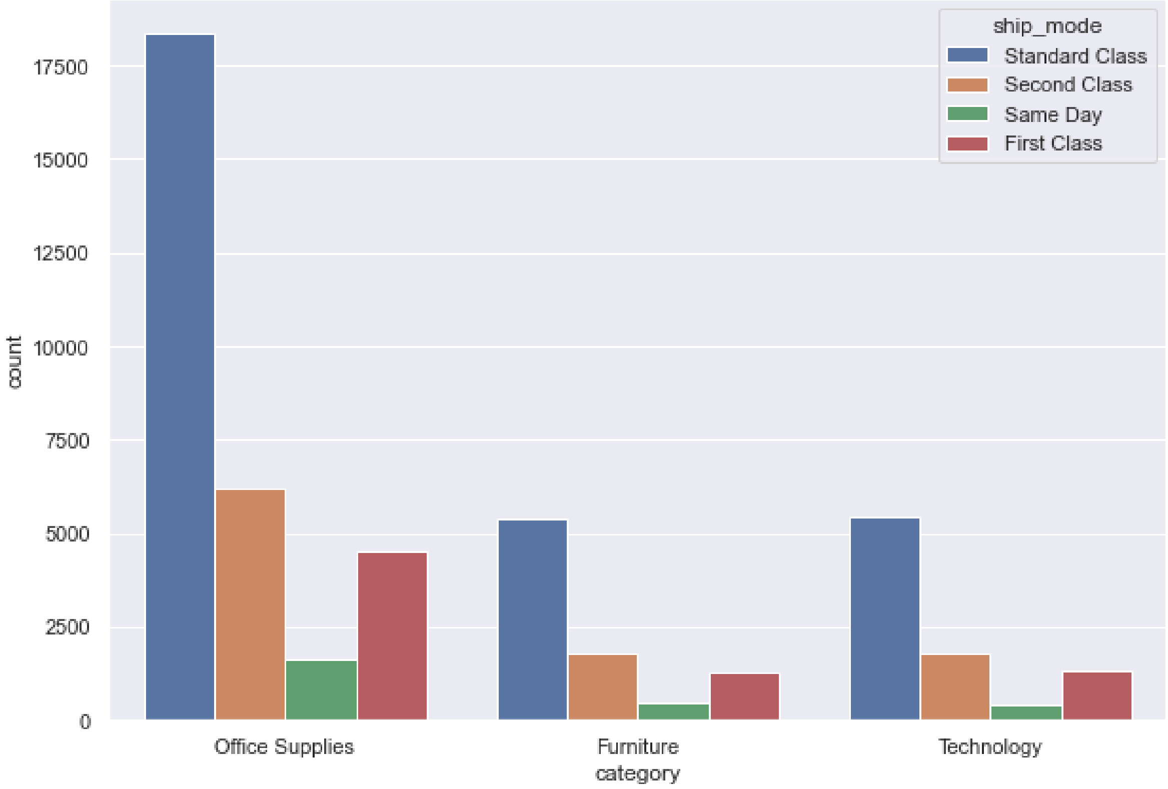
Out[120]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [121]:

```
plt.figure(figsize=(10,7))
sns.countplot(x=df1["category"],hue=df1["ship_mode"])
```

Out[121]:

```
<AxesSubplot:xlabel='category', ylabel='count'>
```



Checking the concentration of customer segment in each market¶

In [122]:

```
df1.columns
```

Out[122]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

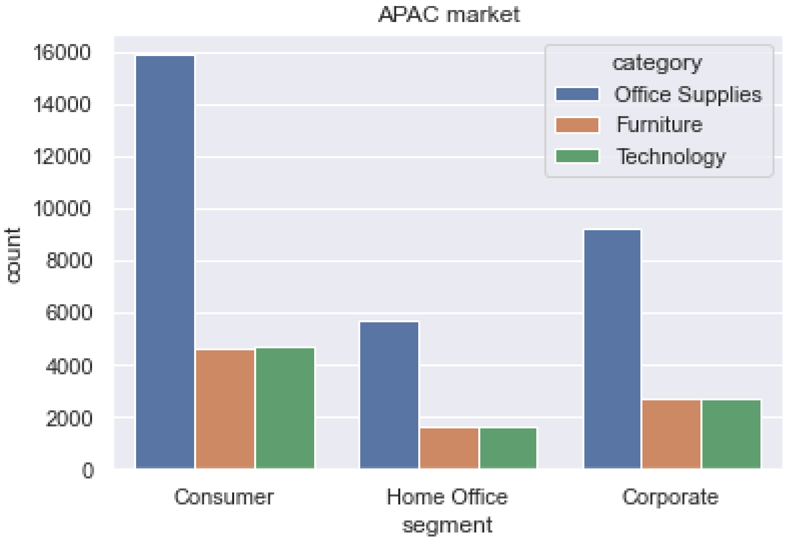
In [123]:

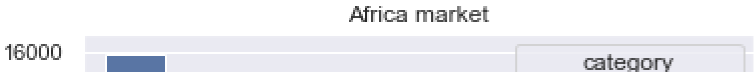
```
df1["market"].unique()
```

Out[123]:

```
array(['Africa', 'APAC', 'EMEA', 'EU', 'Canada', 'LATAM', 'US'],
      dtype=object)
```

```
In [124]: plt.title("APAC market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()

          plt.title("Africa market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()


          plt.title("EMEA market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()


          plt.title("EU market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()


          plt.title("Canada market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()


          plt.title("LATAM market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()



          plt.title("US market")
          sns.countplot(x=df1["segment"],hue=df1["category"])
          plt.show()
```





Analyzing profits from each Category¶

In [125]:
```
df1.columns
```

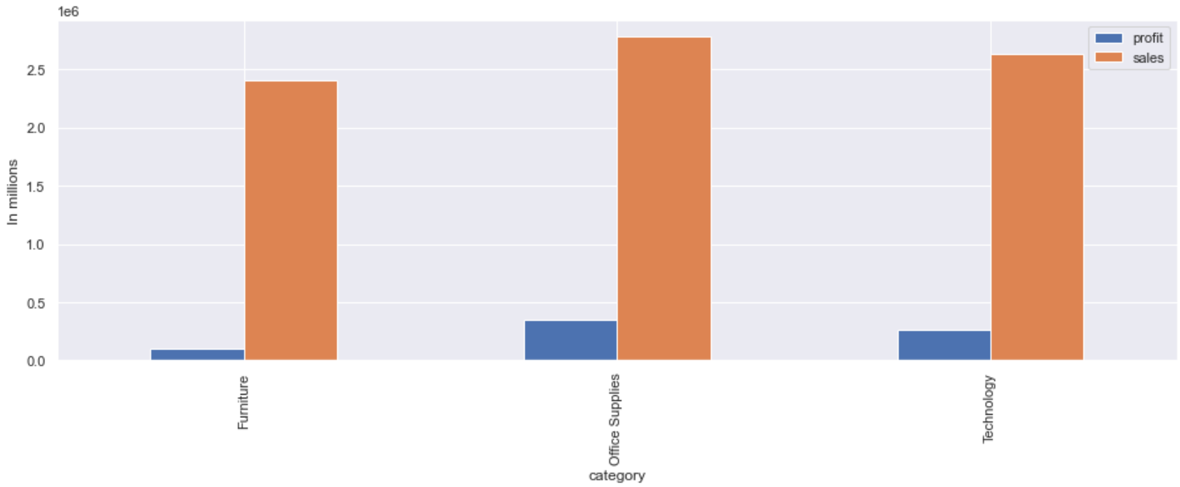
Out[125]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [126]:
```
df29 = df1.groupby("category")[["profit","sales"]].sum()
df29
```

Out[126]:

	profit	sales
category		
Furniture	97049.37790	2406605.0
Office Supplies	350107.32450	2790258.0
Technology	267573.47238	2638265.0

In [127]:
```
df29.plot(kind='bar',figsize=(16,5))
plt.ylabel("In millions")
plt.show()
```



Analyzing profits from each Market in world¶

In [128]:

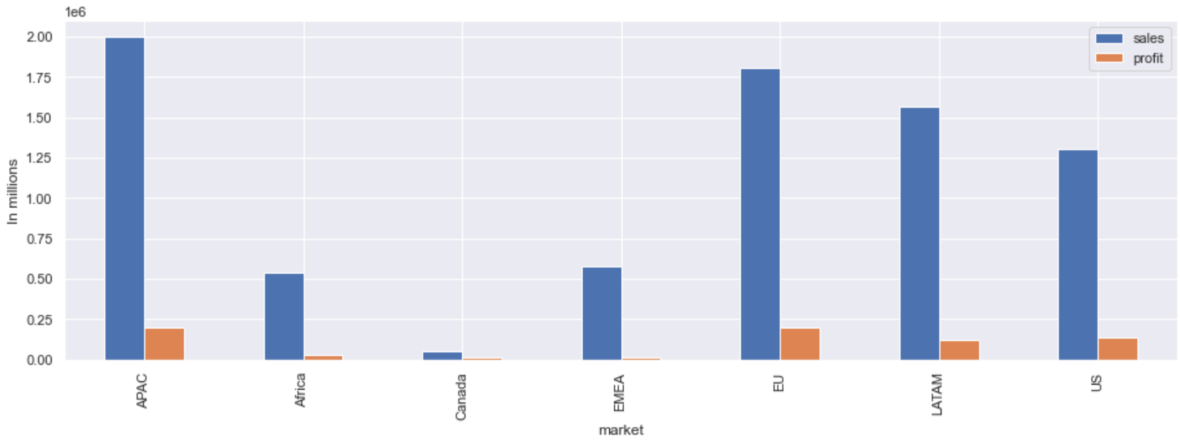
```
df30 = df1.groupby('market')[['sales','profit']].sum()
df30
```

Out[128]:

market	sales	profit
APAC	2000746.0	199907.45090
Africa	538115.0	30140.61900
Canada	50314.0	12332.55000
EMEA	575562.0	11810.25900
EU	1803099.0	199171.49400
LATAM	1563126.0	123074.87028
US	1304166.0	138292.93160

In [129]:

```
df30.plot(kind='bar',figsize=(16,5))
plt.ylabel("In millions")
plt.show()
```



regional profits by segment

In [130]:

```
df1.columns
```

Out[130]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [131]:

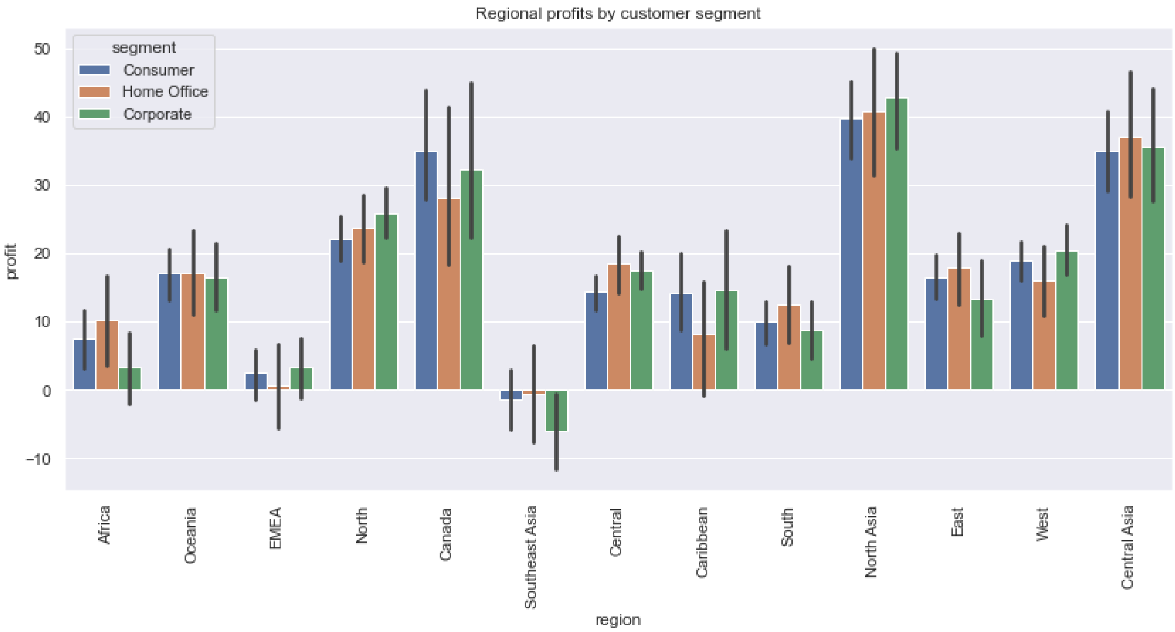
```
df31 = df1.groupby(["region","segment"])[["profit"]].sum()
df31
```

Out[131]:

		profit
region	segment	
Africa	Consumer	17075.41500
	Corporate	4210.48500
	Home Office	8854.71900
Canada	Consumer	6865.14000
	Corporate	3476.58000
	Home Office	1990.83000
Caribbean	Consumer	11362.96628
	Corporate	7235.83972
	Home Office	2780.50296
Central	Consumer	78394.93122
	Corporate	55102.42690
	Home Office	35267.51128
Central Asia	Consumer	33354.81600
	Corporate	19736.76400
	Home Office	13359.39000
EMEA	Consumer	5981.83800
	Corporate	5179.33800
	Home Office	649.08300
East	Consumer	23088.58090
	Corporate	11056.67370
	Home Office	8499.05120
North	Consumer	51483.98052
	Corporate	36503.71956
	Home Office	18634.40824
North Asia	Consumer	42371.26200
	Corporate	27277.88100
	Home Office	17027.55000
Oceania	Consumer	28925.55600
	Corporate	16179.46200
	Home Office	9443.26800
South	Consumer	33151.31248
	Corporate	16640.50416
	Home Office	13963.03026

		profit
region	segment	
Southeast Asia	Consumer	-2395.00430
	Corporate	-5032.36710
	Home Office	-341.12670
West	Consumer	30264.36460
	Corporate	18480.03600
	Home Office	8629.45590

In [132]:
```
plt.figure(figsize=(14,6))
sns.barplot(data = df31, x = df1["region"], y = df1["profit"], hue = df1["segm
plt.xticks(rotation = 90)
plt.title("Regional profits by customer segment")
plt.show()
```



regional sales by segment

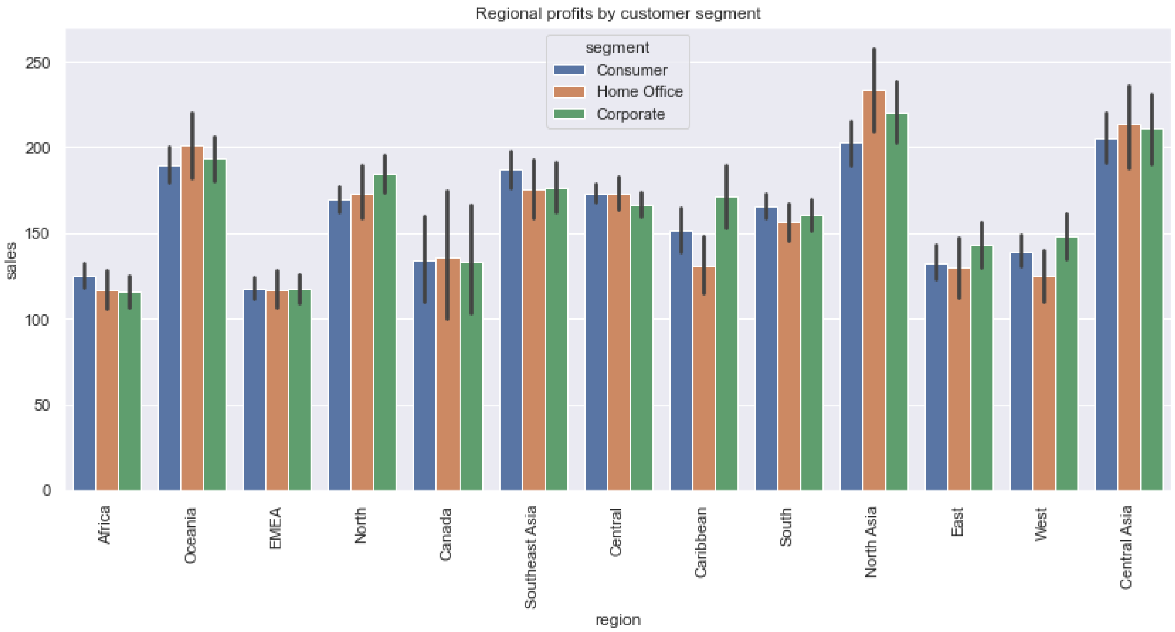
In [133]:
```
df32 = df1.groupby(["region","segment"])[["sales"]].sum()
df32
```

Out[133]:

		sales
region	segment	
Africa	Consumer	288829.0
	Corporate	148790.0
	Home Office	100496.0
Canada	Consumer	26317.0
	Corporate	14371.0
	Home Office	9626.0
Caribbean	Consumer	121909.0
	Corporate	84377.0
	Home Office	45155.0
Central	Consumer	951781.0
	Corporate	523414.0
	Home Office	331443.0
Central Asia	Consumer	195862.0
	Corporate	116873.0
	Home Office	76771.0
EMEA	Consumer	290891.0
	Corporate	180550.0
	Home Office	104121.0
East	Consumer	185562.0
	Corporate	119370.0
	Home Office	61560.0
North	Consumer	393840.0
	Corporate	261153.0
	Home Office	135553.0
North Asia	Consumer	216330.0
	Corporate	139918.0
	Home Office	97438.0
Oceania	Consumer	323314.0
	Corporate	190974.0
	Home Office	111094.0
South	Consumer	551020.0
	Corporate	305163.0
	Home Office	174918.0

		sales
region	**segment**	
Southeast Asia	**Consumer**	289642.0
	Corporate	150063.0
	Home Office	92467.0
West	**Consumer**	222821.0
	Corporate	134245.0
	Home Office	67107.0

In [134]:
```
plt.figure(figsize=(14,6))
sns.barplot(data = df31, x = df1["region"], y = df1["sales"], hue = df1["segme
plt.xticks(rotation = 90)
plt.title("Regional profits by customer segment")
plt.show()
```



profits and sales by sub-category of goods in 2014

In [135]:
```
df1.columns
```

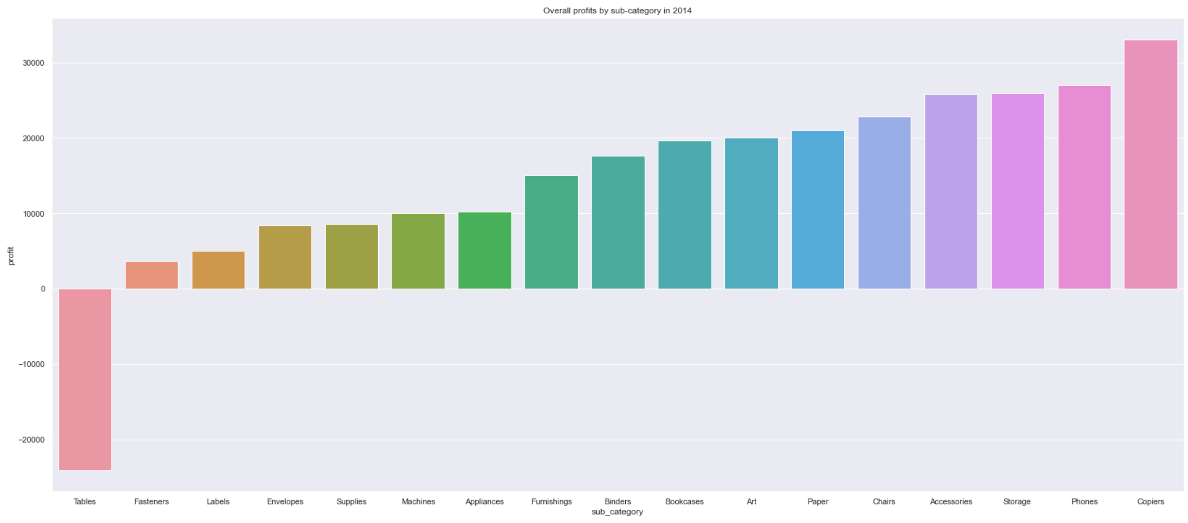
Out[135]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [136]:
```
df33 = df1.groupby(["year","sub_category"])["profit"].sum().reset_index()
df33
```

Out[136]:

	year	sub_category	profit
0	2011	Accessories	10467.3298
1	2011	Appliances	5756.1202
2	2011	Art	10287.7209
3	2011	Binders	4707.4678
4	2011	Bookcases	9853.8312
...	...	...	...
63	2014	Paper	20975.8306
64	2014	Phones	26981.2150
65	2014	Storage	25919.8409
66	2014	Supplies	8597.9678
67	2014	Tables	-24044.9311

In [137]:
```
plt.figure(figsize=[28,12])
sns.barplot(data=df33[df33["year"] == 2014].sort_values(by='profit'), x='sub_c
plt.show()
```



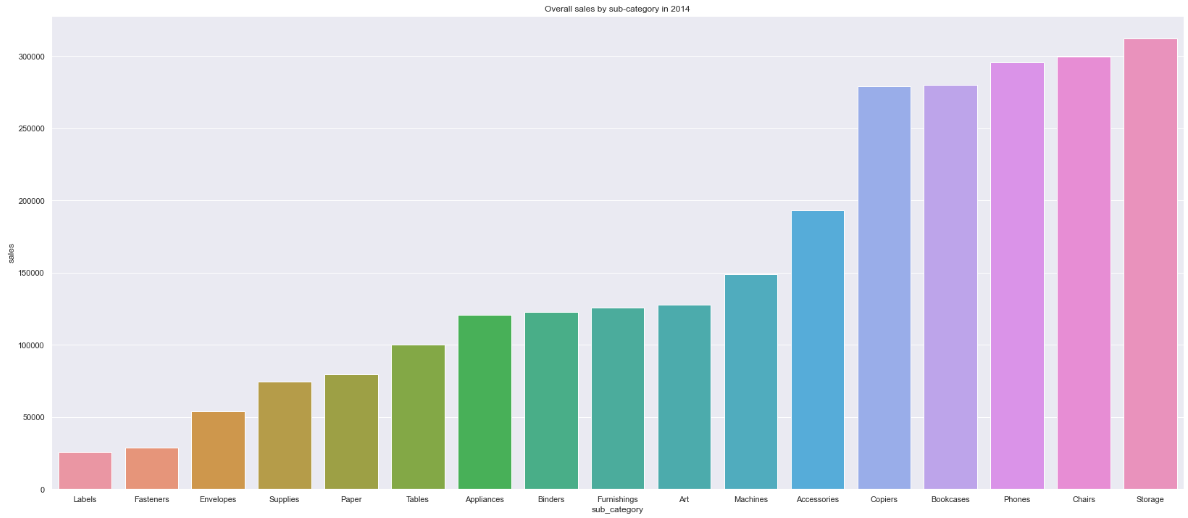
In [138]:
```
df34 = df1.groupby(["year","sub_category"])["sales"].sum().reset_index()
df34
```

Out[138]:

	year	sub_category	sales
0	2011	Accessories	92648.0
1	2011	Appliances	68907.0
2	2011	Art	63049.0
3	2011	Binders	60257.0
4	2011	Bookcases	134937.0
...	...	...	...
63	2014	Paper	79627.0
64	2014	Phones	295662.0
65	2014	Storage	312252.0
66	2014	Supplies	74472.0
67	2014	Tables	100180.0

68 rows × 3 columns

In [139]:
```
plt.figure(figsize=[28,12])
sns.barplot(data=df34[df34["year"] == 2014].sort_values(by='sales'), x='sub_ca
plt.show()
```



Overaqll profit vs sales by sub__category in 2014

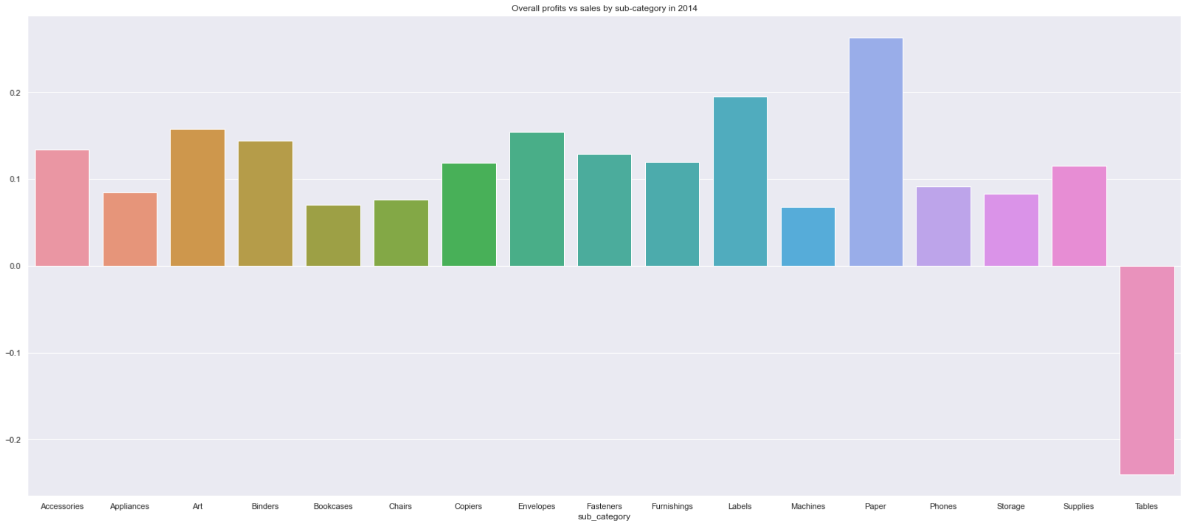
In [140]:
```
df1.columns
```

Out[140]:
```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [141]:
```
df35 = df33[df33["year"]==2014]["profit"]/df34[df34["year"] == 2014]["sales"]
df35
```

Out[141]:
```
51    0.133598
52    0.084353
53    0.157384
54    0.143995
55    0.070289
56    0.076379
57    0.118605
58    0.154525
59    0.128578
60    0.119401
61    0.195095
62    0.067641
63    0.263426
64    0.091257
65    0.083009
66    0.115452
67   -0.240017
dtype: float64
```

In [142]:
```
plt.figure(figsize=[28,12])
sns.barplot(x=df34['sub_category'], y=df35).set_title("Overall profits vs sale
plt.show()
```



Most profitable category in sub-category

In [143]:

```
df1.columns
```

Out[143]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [144]:

```
df36 = df1.groupby(["category","sub_category"])[["profit"]].sum()
df36
```

Out[144]:

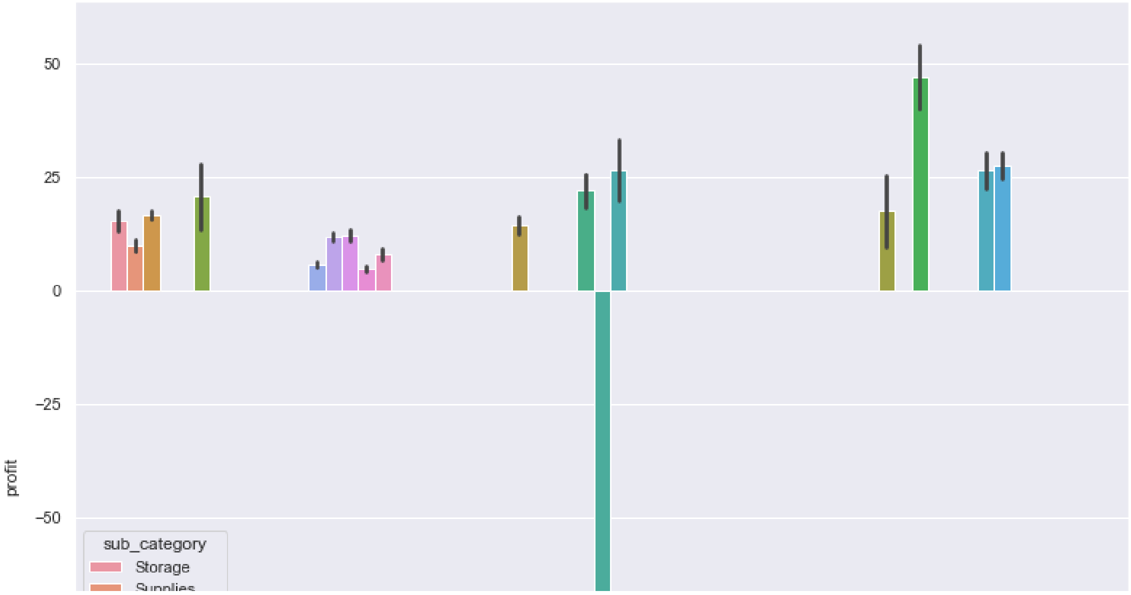
		profit
category	**sub_category**	
Furniture	**Bookcases**	53580.68990
	Chairs	68377.74450
	Furnishings	45012.21550
	Tables	-69921.27200
Office Supplies	**Appliances**	29702.84570
	Art	57842.60850
	Binders	48538.11600
	Envelopes	29601.11630
	Fasteners	11525.42410
	Labels	15010.51200
	Paper	59207.68270
	Storage	74684.47350
	Supplies	23994.54570
Technology	**Accessories**	81507.85580
	Copiers	85220.44908
	Machines	22674.96240
	Phones	78170.20510

In [145]:

```
plt.figure(figsize=(13,12))
sns.barplot(data = df36, x = df1["category"],y= df1["profit"],hue = df1["sub_c
```

Out[145]:

```
<AxesSubplot:xlabel='category', ylabel='profit'>
```



Part2 Machine learning

In [146]:

```
df2 = df1
```

In [147]:

```
df2
```

Out[147]:

	order_id	order_date	ship_date	ship_mode	customer_name	segment	state	co
0	AG-2011-2040	2011-01-01	2011-06-01	Standard Class	Toby Braunhardt	Consumer	Constantine	A
1	IN-2011-47883	2011-01-01	2011-08-01	Standard Class	Joseph Holt	Consumer	New South Wales	Au
2	HU-2011-1220	2011-01-01	2011-05-01	Second Class	Annie Thurman	Consumer	Budapest	Hu
3	IT-2011-3647632	2011-01-01	2011-05-01	Second Class	Eugene Moren	Home Office	Stockholm	Sv
4	IN-2011-47883	2011-01-01	2011-08-01	Standard Class	Joseph Holt	Consumer	New South Wales	Au
...	...	...	...	...	...	...	...	
51285	CA-2014-115427	2014-12-31	2015-04-01	Standard Class	Erica Bern	Corporate	California	U S
51286	MO-2014-2560	2014-12-31	2015-05-01	Standard Class	Liz Preis	Consumer	Souss-Massa-Draâ	Mc
51287	MX-2014-110527	2014-12-31	2015-02-01	Second Class	Charlotte Melton	Consumer	Managua	Nica
51288	MX-2014-114783	2014-12-31	2015-06-01	Standard Class	Tamara Dahlen	Consumer	Chihuahua	M
51289	CA-2014-156720	2014-12-31	2015-04-01	Standard Class	Jill Matthias	Consumer	Colorado	U S

48660 rows × 21 columns

In [148]:

```
df2.isnull().sum().any()
```

Out[148]:

```
False
```

In [149]:

```
df2.columns
```

Out[149]:

```
Index(['order_id', 'order_date', 'ship_date', 'ship_mode', 'customer_name',
       'segment', 'state', 'country', 'market', 'region', 'product_id',
       'category', 'sub_category', 'product_name', 'sales', 'quantity',
       'discount', 'profit', 'shipping_cost', 'order_priority', 'year'],
      dtype='object')
```

In [150]:
```
df2 = df2.drop(columns = ["order_id","order_date","ship_date","customer_name",
```

In [151]:
```
df2
```

Out[151]:

	ship_mode	segment	market	region	category	sub_category	sales	quantity	discoun
0	Standard Class	Consumer	Africa	Africa	Office Supplies	Storage	408.0	2	0.
1	Standard Class	Consumer	APAC	Oceania	Office Supplies	Supplies	120.0	3	0.
2	Second Class	Consumer	EMEA	EMEA	Office Supplies	Storage	66.0	4	0.
3	Second Class	Home Office	EU	North	Office Supplies	Paper	45.0	3	0.
4	Standard Class	Consumer	APAC	Oceania	Furniture	Furnishings	114.0	5	0.
...	...	...	...	...	...	...	...	...	.
51285	Standard Class	Corporate	US	West	Office Supplies	Binders	14.0	2	0.
51286	Standard Class	Consumer	Africa	Africa	Office Supplies	Binders	4.0	1	0.
51287	Second Class	Consumer	LATAM	Central	Office Supplies	Labels	26.0	3	0.
51288	Standard Class	Consumer	LATAM	North	Office Supplies	Labels	7.0	1	0.
51289	Standard Class	Consumer	US	West	Office Supplies	Fasteners	3.0	3	0.

48660 rows × 12 columns

In [152]:
```
df2["order_priority"].unique()
```

Out[152]:
```
array(['Medium', 'High', 'Critical', 'Low'], dtype=object)
```

In [153]:
```
labelencoder = LabelEncoder()
```

In [154]:
```
df2["order_priority"] = labelencoder.fit_transform(df2["order_priority"])
```

In [155]:
```
df2
```

Out[155]:

	ship_mode	segment	market	region	category	sub_category	sales	quantity	disc
0	Standard Class	Consumer	Africa	Africa	Office Supplies	Storage	408.0	2	
1	Standard Class	Consumer	APAC	Oceania	Office Supplies	Supplies	120.0	3	
2	Second Class	Consumer	EMEA	EMEA	Office Supplies	Storage	66.0	4	
3	Second Class	Home Office	EU	North	Office Supplies	Paper	45.0	3	
4	Standard Class	Consumer	APAC	Oceania	Furniture	Furnishings	114.0	5	
...	...	...	...	...	...	...	...	...	
51285	Standard Class	Corporate	US	West	Office Supplies	Binders	14.0	2	

In [156]:
```
df2 = pd.get_dummies(df2)
```

In [157]:

```
df2.sample(15)
```

Out[157]:

	sales	quantity	discount	profit	shipping_cost	order_priority	ship_mode_First Class	ship_
22397	336.0	6	0.10	111.7440	37.30	1	0	
32276	55.0	1	0.00	26.9304	3.24	3	0	
33310	132.0	3	0.00	47.5200	7.83	3	0	
47325	87.0	8	0.40	-7.3280	6.20	3	0	
21349	35.0	3	0.00	11.9952	3.88	1	0	
43124	880.0	4	0.40	44.0160	61.06	3	0	
49449	49.0	2	0.00	1.4400	10.73	1	0	
14525	13.0	1	0.00	5.0700	0.84	3	0	
39406	54.0	2	0.00	24.3600	7.56	1	0	
6521	26.0	7	0.17	3.9921	2.02	3	0	
47490	20.0	3	0.10	0.6210	3.04	1	0	
7446	266.0	5	0.40	-168.6800	10.62	3	0	
4195	13.0	4	0.60	-5.9520	1.17	3	0	
32669	21.0	2	0.00	3.9600	0.92	3	0	
46380	57.0	3	0.00	28.3500	5.99	3	0	

15 rows × 53 columns

In [158]:

```
df2.describe()
```

Out[158]:

	sales	quantity	discount	profit	shipping_cost	order_priority	sl
count	48660.000000	48660.000000	48660.000000	48660.000000	48660.000000	48660.000000	
mean	161.017838	3.350658	0.145722	14.688249	17.593780	2.119503	
std	201.092519	2.198216	0.215066	86.825672	28.559365	1.080231	
min	0.000000	1.000000	0.000000	-1924.542000	0.000000	0.000000	
25%	29.000000	2.000000	0.000000	0.000000	2.450000	1.000000	
50%	77.000000	3.000000	0.000000	8.460000	7.030000	3.000000	
75%	208.000000	4.000000	0.200000	31.154400	20.152500	3.000000	
max	999.000000	14.000000	0.850000	486.600000	427.100000	3.000000	

8 rows × 53 columns

In [159]:
```
x = df2.drop("order_priority",axis = 1)
```

In [160]:
```
x
```

Out[160]:

	sales	quantity	discount	profit	shipping_cost	ship_mode_First Class	ship_mode_Same Day	sl
0	408.0	2	0.0	106.1400	35.46	0	0	
1	120.0	3	0.1	36.0360	9.72	0	0	
2	66.0	4	0.0	29.6400	8.17	0	0	
3	45.0	3	0.5	-26.0550	4.82	0	0	
4	114.0	5	0.1	37.7700	4.70	0	0	
...	...	...	...	...	...	...	...	
51285	14.0	2	0.2	4.5188	0.89	0	0	
51286	4.0	1	0.0	0.4200	0.49	0	0	
51287	26.0	3	0.0	12.3600	0.35	0	0	
51288	7.0	1	0.0	0.5600	0.20	0	0	
51289	3.0	3	0.2	-0.6048	0.17	0	0	

48660 rows × 52 columns

In [161]:
```
y = df2["order_priority"]
```

In [162]:
```
y
```

Out[162]:
```
0        3
1        3
2        1
3        1
4        3
        ..
51285    3
51286    3
51287    3
51288    3
51289    3
Name: order_priority, Length: 48660, dtype: int32
```

Data Split for traing data and test¶

In [163]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.4,random_st
```

In [164]:

```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[164]:

```
((29196, 52), (19464, 52), (29196,), (19464,))
```

In [165]:

```
y_test
```

Out[165]:

```
25041    0
25688    3
11991    1
33176    1
2687     2
        ..
39970    1
7138     3
25105    1
45986    3
29991    1
Name: order_priority, Length: 19464, dtype: int32
```

Feature Scalling¶

In [166]:

```
st = StandardScaler()
x_train = st.fit_transform(x_train)
x_test = st.fit_transform(x_test)
```

In [167]:

```
x_train
```

Out[167]:

```
array([[ 1.61098266, -0.61504197, -0.67566805, ..., -0.33683628,
        -0.22835504, -0.11344942],
       [ 2.05504396, -0.15976027, -0.20984457, ...,  2.96880136,
        -0.22835504, -0.11344942],
       [-0.76898635, -1.07032367,  1.65344932, ..., -0.33683628,
        -0.22835504, -0.11344942],
       ...,
       [-0.65921838, -1.07032367, -0.67566805, ..., -0.33683628,
        -0.22835504, -0.11344942],
       [-0.72408127,  0.75080312, -0.67566805, ..., -0.33683628,
        -0.22835504, -0.11344942],
       [-0.03553678,  0.29552142,  2.58509627, ..., -0.33683628,
        -0.22835504, -0.11344942]])
```

```
In [168]: x_test
```

```
Out[168]: array([[-0.41497337, -0.61353931, -0.68043682, ..., -0.33157994,
                   4.36646074, -0.11078704],
                 [-0.64259729, -0.61353931, -0.2167086 , ..., -0.33157994,
                  -0.22901843, -0.11078704],
                 [-0.66733902, -1.06791603, -0.68043682, ..., -0.33157994,
                   4.36646074, -0.11078704],
                 ...,
                 [ 0.70335283, -0.61353931, -0.68043682, ..., -0.33157994,
                  -0.22901843, -0.11078704],
                 [-0.26652299, -0.61353931, -0.68043682, ..., -0.33157994,
                  -0.22901843, -0.11078704],
                 [ 3.91977776,  2.56709777,  1.17447605, ..., -0.33157994,
                  -0.22901843, -0.11078704]])
```

```
In [169]: model = LogisticRegression()
          model.fit(x_train, y_train)
```

```
Out[169]: LogisticRegression()
```

```
In [170]: model.score(x_test, y_test)
```

```
Out[170]: 0.6580867242087958
```

```
In [171]: model.score(x_train, y_train)
```

```
Out[171]: 0.6600904233456638
```

after remove outlier

```
In [172]: df3 = df2
```

```
In [173]: z_scores = np.abs((df3 - df3.mean()) / df3.std())
```

In [174]:
```
z_scores
```

Out[174]:

	sales	quantity	discount	profit	shipping_cost	order_priority	ship_mode_First Class
0	1.228202	0.614434	0.677567	1.053280	0.625582	0.815101	0.414036
1	0.203975	0.159519	0.212593	0.245869	0.275699	0.815101	0.414036
2	0.472508	0.295395	0.677567	0.172204	0.329972	1.036355	0.414036
3	0.576938	0.159519	1.647302	0.469253	0.447271	1.036355	0.414036
4	0.233812	0.750310	0.212593	0.265840	0.451473	0.815101	0.414036
...	...	...	...	...	...	...	...
51285	0.731096	0.614434	0.252380	0.117125	0.584879	0.815101	0.414036
51286	0.780824	1.069348	0.677567	0.164332	0.598885	0.815101	0.414036
51287	0.671421	0.159519	0.677567	0.026815	0.603787	0.815101	0.414036
51288	0.765905	1.069348	0.677567	0.162720	0.609039	0.815101	0.414036
51289	0.785797	0.159519	0.252380	0.176135	0.610090	0.815101	0.414036

48660 rows × 53 columns

In [175]:
```
threshold = 3
outliers = (z_scores > threshold).any(axis=1)
```

In [176]:
```
outliers
```

Out[176]:
```
0         True
1         True
2        False
3         True
4         True
         ...
51285     True
51286     True
51287     True
51288     True
51289     True
Length: 48660, dtype: bool
```

In [177]:
```
cleaned_df = df3[~outliers]
```

In [178]:
```
cleaned_df
```

Out[178]:
```
        sales  quantity  discount  profit  shipping_cost  order_priority  ship_mode_First  ship_mc
                                                                                    Class
    2    66.0         4       0.0   29.64           8.17               1                0
   21    52.0         1       0.0    7.77           5.91               1                0
   22    62.0         2       0.0    8.70           5.16               3                0
   30   140.0         3       0.0   20.88          10.78               3                0
   44   207.0         4       0.0   76.56          20.64               3                1
  ...     ...       ...       ...     ...            ...             ...              ...
51234   557.0         3       0.1  216.72          51.79               3                0
51261    59.0         3       0.0   16.44           6.34               1                0
51267    30.0         2       0.5   -9.69           4.46               1                0
51272    23.0         4       0.5   -6.42           3.46               1                0
51279    32.0         5       0.0    8.25           2.21               3                0

6881 rows × 53 columns
```

In [179]:
```
x = cleaned_df.drop("order_priority",axis = 1)
```

In [180]:
```
x
```

Out[180]:
```
        sales  quantity  discount  profit  shipping_cost  ship_mode_First  ship_mode_Same
                                                                    Class             Day
    2    66.0         4       0.0   29.64           8.17                0               0
   21    52.0         1       0.0    7.77           5.91                0               0
   22    62.0         2       0.0    8.70           5.16                0               0
   30   140.0         3       0.0   20.88          10.78                0               0
   44   207.0         4       0.0   76.56          20.64                1               0
  ...     ...       ...       ...     ...            ...              ...             ...
51234   557.0         3       0.1  216.72          51.79                0               0
51261    59.0         3       0.0   16.44           6.34                0               0
51267    30.0         2       0.5   -9.69           4.46                0               0
51272    23.0         4       0.5   -6.42           3.46                0               0
```

In [181]:
```
y = cleaned_df["order_priority"]
```

In [182]:
```
y
```

Out[182]:
```
2        1
21       1
22       3
30       3
44       3
        ..
51234    3
51261    1
51267    1
51272    1
51279    3
Name: order_priority, Length: 6881, dtype: int32
```

In [183]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.4,random_st
```

In [184]:
```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[184]:
```
((4128, 52), (2753, 52), (4128,), (2753,))
```

In [185]:
```
y_test
```

Out[185]:
```
35090    1
7657     3
37532    1
4908     1
39452    3
        ..
23866    3
26369    3
11865    3
21789    3
5580     3
Name: order_priority, Length: 2753, dtype: int32
```

In [186]:
```
st = StandardScaler()
x_train = st.fit_transform(x_train)
x_test = st.fit_transform(x_test)
```

In [187]:
```
x_train
```

Out[187]:
```
array([[ 0.66271247, -0.60359554, -0.63359378, ...,  1.47409087,
         0.        ,  0.        ],
       [ 0.10138497,  0.41506447, -0.63359378, ...,  1.47409087,
         0.        ,  0.        ],
       [-0.54630061, -0.09426553, -0.63359378, ..., -0.67838423,
         0.        ,  0.        ],
       ...,
       [-0.71901677, -1.11292554, -0.63359378, ..., -0.67838423,
         0.        ,  0.        ],
       [-0.39085607, -1.11292554, -0.63359378, ..., -0.67838423,
         0.        ,  0.        ],
       [ 2.61440502, -0.60359554, -0.63359378, ...,  1.47409087,
         0.        ,  0.        ]])
```

In [188]:
```
x_test
```

Out[188]:
```
array([[-0.40037643, -0.58991909, -0.63513045, ..., -0.65981007,
         0.        ,  0.        ],
       [-0.65977498, -0.08065372, -0.63513045, ..., -0.65981007,
         0.        ,  0.        ],
       [-0.44360952,  0.937877  ,  1.55215267, ..., -0.65981007,
         0.        ,  0.        ],
       ...,
       [-0.28797039, -0.08065372, -0.63513045, ..., -0.65981007,
         0.        ,  0.        ],
       [-0.12368465,  0.42861164, -0.63513045, ..., -0.65981007,
         0.        ,  0.        ],
       [ 0.1357139 , -0.58991909, -0.63513045, ..., -0.65981007,
         0.        ,  0.        ]])
```

In [189]:
```
model = LogisticRegression()
model.fit(x_train, y_train)
```

Out[189]:
```
LogisticRegression()
```

In [190]:
```
model.score(x_test, y_test)
```

Out[190]:
```
0.6694515074464221
```

In [191]:
```
model.score(x_train, y_train)
```

Out[191]:
```
0.6790213178294574
```

In [192]:
```
df4 = df2
```

In [193]:
```
df4
```

Out[193]:
```
                                                                     ship_mode_First  ship_
       sales  quantity  discount     profit  shipping_cost  order_priority        Class
    0  408.0         2       0.0   106.1400          35.46               3            0
    1  120.0         3       0.1    36.0360           9.72               3            0
    2   66.0         4       0.0    29.6400           8.17               1            0
    3   45.0         3       0.5   -26.0550           4.82               1            0
    4  114.0         5       0.1    37.7700           4.70               3            0
  ...    ...       ...       ...        ...            ...             ...          ...
51285   14.0         2       0.2     4.5188           0.89               3            0
51286    4.0         1       0.0     0.4200           0.49               3            0
51287   26.0         3       0.0    12.3600           0.35               3            0
51288    7.0         1       0.0     0.5600           0.20               3            0
51289    3.0         3       0.2    -0.6048           0.17               3            0

48660 rows × 53 columns
```

In [194]:
```
def remove_outliers(df4, columns, threshold=3):
    z_scores = np.abs(stats.zscore(df4[columns]))
    outliers_mask = (z_scores > threshold).any(axis=1)
    df_no_outliers = df4[~outliers_mask]
    return df_no_outliers
```

In [195]:
```
columns_to_check = ['sales', 'quantity', 'discount',"profit","shipping_cost"]
```

In [196]:
```
df_no_outliers = remove_outliers(df4, columns_to_check)
```

In [197]:
```
df_no_outliers
```

Out[197]:
```
        sales  quantity  discount     profit  shipping_cost  order_priority  ship_mode_First  ship_
                                                                                       Class
    0   408.0         2       0.0   106.1400          35.46               3                0
    1   120.0         3       0.1    36.0360           9.72               3                0
    2    66.0         4       0.0    29.6400           8.17               1                0
    3    45.0         3       0.5   -26.0550           4.82               1                0
    4   114.0         5       0.1    37.7700           4.70               3                0
  ...     ...       ...       ...        ...            ...             ...              ...
51285    14.0         2       0.2     4.5188           0.89               3                0
51286     4.0         1       0.0     0.4200           0.49               3                0
51287    26.0         3       0.0    12.3600           0.35               3                0
51288     7.0         1       0.0     0.5600           0.20               3                0
51289     3.0         3       0.2    -0.6048           0.17               3                0

45220 rows × 53 columns
```

In [198]:
```
x = df_no_outliers.drop("order_priority",axis = 1)
```

In [199]:
```
y = df_no_outliers["order_priority"]
```

In [200]:
```
x
```

Out[200]:

	sales	quantity	discount	profit	shipping_cost	ship_mode_First Class	ship_mode_Same Day	sl
0	408.0	2	0.0	106.1400	35.46	0	0	
1	120.0	3	0.1	36.0360	9.72	0	0	
2	66.0	4	0.0	29.6400	8.17	0	0	
3	45.0	3	0.5	-26.0550	4.82	0	0	
4	114.0	5	0.1	37.7700	4.70	0	0	
...	...	...	...	...	...	...	...	
51285	14.0	2	0.2	4.5188	0.89	0	0	
51286	4.0	1	0.0	0.4200	0.49	0	0	
51287	26.0	3	0.0	12.3600	0.35	0	0	
51288	7.0	1	0.0	0.5600	0.20	0	0	
51289	3.0	3	0.2	-0.6048	0.17	0	0	

45220 rows × 52 columns

In [201]:
```
y
```

Out[201]:
```
0        3
1        3
2        1
3        1
4        3
        ..
51285    3
51286    3
51287    3
51288    3
51289    3
Name: order_priority, Length: 45220, dtype: int32
```

In [202]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.4,random_st
```

In [203]:
```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[203]:
```
((27132, 52), (18088, 52), (27132,), (18088,))
```

```
In [204]: st = StandardScaler()
          x_train = st.fit_transform(x_train)
          x_test = st.fit_transform(x_test)
```

```
In [205]: x_train
```

```
Out[205]: array([[-0.28765687,  0.96008078, -0.66964854, ..., -0.33522756,
                  -0.23166766, -0.08916317],
                 [-0.03723694,  0.96008078, -0.66964854, ..., -0.33522756,
                  -0.23166766, -0.08916317],
                 [-0.59079679,  0.96008078, -0.66964854, ..., -0.33522756,
                  -0.23166766, -0.08916317],
                 ...,
                 [ 0.91831281,  0.96008078, -0.185704  , ..., -0.33522756,
                  -0.23166766, -0.08916317],
                 [ 1.85409257, -0.08054369, -0.66964854, ...,  2.9830483 ,
                  -0.23166766, -0.08916317],
                 [ 0.77333285,  2.00070526,  0.54021282, ..., -0.33522756,
                  -0.23166766, -0.08916317]])
```

```
In [206]: x_test
```

```
Out[206]: array([[-0.68298941, -0.59986396, -0.1900683 , ..., -0.33672207,
                  -0.23972604, -0.09565429],
                 [-0.01599248, -0.59986396,  1.72996042, ...,  2.96980826,
                  -0.23972604, -0.09565429],
                 [ 3.96617734, -0.08362363, -0.33407045, ..., -0.33672207,
                  -0.23972604, -0.09565429],
                 ...,
                 [-0.81506801, -1.11610429,  2.68997477, ...,  2.96980826,
                  -0.23972604, -0.09565429],
                 [-0.73582085, -0.59986396, -0.67007548, ..., -0.33672207,
                  -0.23972604, -0.09565429],
                 [-0.80846408, -1.11610429,  0.28993888, ..., -0.33672207,
                  -0.23972604, -0.09565429]])
```

```
In [207]: model = LogisticRegression()
          model.fit(x_train, y_train)
```

```
Out[207]: LogisticRegression()
```

```
In [208]: model.score(x_test, y_test)
```

```
Out[208]: 0.6653029632905794
```

```
In [209]: model.score(x_train, y_train)
```

```
Out[209]: 0.6672195193867021
```