WALMART CASE STUDY

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
from scipy.stats import norm

data=pd.read_csv("/content/walmart_data.csv")

df=data.copy()
df.head()

   User_ID Product_ID Gender   Age  Occupation City_Category  \
0  1000001  P00069042      F  0-17          10             A
1  1000001  P00248942      F  0-17          10             A
2  1000001  P00087842      F  0-17          10             A
3  1000001  P00085442      F  0-17          10             A
4  1000002  P00285442      M   55+          16             C

  Stay_In_Current_City_Years  Marital_Status  Product_Category
Purchase
0                          2               0                 3
8370
1                          2               0                 1
15200
2                          2               0                12
1422
3                          2               0                12
1057
4                         4+               0                 8
7969

#on shape of data
df.shape

(550068, 10)

df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 550068 entries, 0 to 550067
Data columns (total 10 columns):
 #   Column                      Non-Null Count   Dtype
---  ------                      --------------   -----
 0   User_ID                     550068 non-null  int64
 1   Product_ID                  550068 non-null  object
 2   Gender                      550068 non-null  object
```

```
 3   Age                         550068 non-null  object
 4   Occupation                  550068 non-null  int64
 5   City_Category               550068 non-null  object
 6   Stay_In_Current_City_Years  550068 non-null  object
 7   Marital_Status              550068 non-null  int64
 8   Product_Category            550068 non-null  int64
 9   Purchase                    550068 non-null  int64
dtypes: int64(5), object(5)
memory usage: 42.0+ MB
```

```
data_types=df.dtypes
data_types
```

```
User_ID                        int64
Product_ID                    object
Gender                        object
Age                           object
Occupation                     int64
City_Category                 object
Stay_In_Current_City_Years    object
Marital_Status                 int64
Product_Category               int64
Purchase                       int64
dtype: object
```

```
#categorical_cols = ['Gender', 'Age', 'Occupation', 'City_Category',
'Stay_In_Current_City_Years', 'Marital_Status', 'Product_Category']
```

```
categorical_attributes = ['Gender', 'Age', 'Occupation',
'City_Category', 'Stay_In_Current_City_Years', 'Marital_Status',
'Product_Category']
for category in categorical_attributes:
    df[category] = df[category].astype('category')
```

```
df.dtypes
```

```
User_ID                          int64
Product_ID                      object
Gender                        category
Age                           category
Occupation                    category
City_Category                 category
Stay_In_Current_City_Years    category
Marital_Status                category
Product_Category              category
Purchase                         int64
dtype: object
```

```
df.describe()
```

```
              User_ID       Purchase
count  5.500680e+05  550068.000000
mean   1.003029e+06    9263.968713
std    1.727592e+03    5023.065394
min    1.000001e+06      12.000000
25%    1.001516e+06    5823.000000
50%    1.003077e+06    8047.000000
75%    1.004478e+06   12054.000000
max    1.006040e+06   23961.000000

df[categorical_attributes].describe()

        Gender     Age  Occupation City_Category
Stay_In_Current_City_Years  \
count   550068  550068      550068        550068
550068
unique       2       7          21             3
5
top          M   26-35           4             B
1
freq    414259  219587       72308        231173
193821

        Marital_Status  Product_Category
count           550068            550068
unique               2                20
top                  0                 5
freq            324731            150933
```

1. Gender - Out of 5,50,068 transactions, 4,14,259 (nearly 75%) were done by male gender indicating a significant disparity in purchase behavior between males and females during the Black Friday event.
2. Age - We have 7 unique age groups in the dataset. 26 - 35 Age group has maximum of 2,19,587 transactions.
3. Occupation-We have 21 unique occupation groups in the dataset. 4th Occupation group has maximum of 72308.
4. City_Category- We have 3 unique groups in the dataset.B is the top City_Cartegory has maximum of 231173.
5. Stay_In_Current_City_Years - Customers with 1 year of stay in current city accounted to maximum of 1,93,821 transactions among all the other customers with (0,2,3,4+) years of stay in current city
6. Marital_Status - 59%(324731) of the total transactions were done by Unmarried Customers and 41% by Married Customers.

7. Product_Category-We have 20 unique Product_Category groups in the dataset. 5th Product_Category group has maximum of 150933.

```
df.isnull().sum()
```

```
User_ID                       0
Product_ID                    0
Gender                        0
Age                           0
Occupation                    0
City_Category                 0
Stay_In_Current_City_Years    0
Marital_Status                0
Product_Category              0
Purchase                      0
dtype: int64
```

There are no missing values in the dataset.

```
df['User_ID'].nunique()
```

```
5891
```

```
df['User_ID'].value_counts()
```

```
1001680    1026
1004277     979
1001941     898
1001181     862
1000889     823
           ...
1002690       7
1002111       7
1005810       7
1004991       7
1000708       6
Name: User_ID, Length: 5891, dtype: int64
```

```
df['Product_ID'].nunique()
```

```
3631
```

```
df['Product_ID'].value_counts()
```

```
P00265242    1880
P00025442    1615
P00110742    1612
P00112142    1562
P00057642    1470
             ...
P00314842       1
```

```
P00298842       1
P00231642       1
P00204442       1
P00066342       1
Name: Product_ID, Length: 3631, dtype: int64
```

```python
df['Gender'].nunique()
```

```
2
```

```python
df['Gender'].value_counts()
```

```
M    414259
F    135809
Name: Gender, dtype: int64
```

```python
df['Age'].nunique()
```

```
7
```

```python
df['Age'].value_counts()
```

```
26-35    219587
36-45    110013
18-25     99660
46-50     45701
51-55     38501
55+       21504
0-17      15102
Name: Age, dtype: int64
```

```python
df['Occupation'].nunique()
```

```
21
```

```python
df['Occupation'].value_counts()
```

```
4     72308
0     69638
7     59133
1     47426
17    40043
20    33562
12    31179
14    27309
2     26588
16    25371
6     20355
3     17650
10    12930
5     12177
15    12165
```

```
11     11586
19      8461
13      7728
18      6622
9       6291
8       1546
Name: Occupation, dtype: int64
```

```
df['City_Category'].nunique()
```

```
3
```

```
df['City_Category'].value_counts()
```

```
B    231173
C    171175
A    147720
Name: City_Category, dtype: int64
```

```
df['Stay_In_Current_City_Years'].nunique()
```

```
5
```

```
df['Stay_In_Current_City_Years'].value_counts()
```

```
1      193821
2      101838
3       95285
4+      84726
0       74398
Name: Stay_In_Current_City_Years, dtype: int64
```

```
df['Marital_Status'].nunique()
```

```
2
```

```
df['Marital_Status'].value_counts()
```

```
0    324731
1    225337
Name: Marital_Status, dtype: int64
```

```
df['Product_Category'].nunique()
```

```
20
```

```
df['Product_Category'].value_counts()
```

```
5      150933
1      140378
8      113925
11      24287
2       23864
```

```
6      20466
3      20213
4      11753
16      9828
15      6290
13      5549
10      5125
12      3947
7       3721
18      3125
20      2550
19      1603
14      1523
17       578
9        410
Name: Product_Category, dtype: int64
```

```
df['Purchase'].nunique()
```

```
18105
```

```
df['Purchase'].value_counts()
```

```
7011     191
7193     188
6855     187
6891     184
7012     183
        ...
23491      1
18345      1
3372       1
855        1
21489      1
Name: Purchase, Length: 18105, dtype: int64
```

```
df.duplicated().value_counts()
```

```
False    550068
dtype: int64
```

There are no duplicate entries in the datase

```
# checking null values
df.isnull().sum()
```

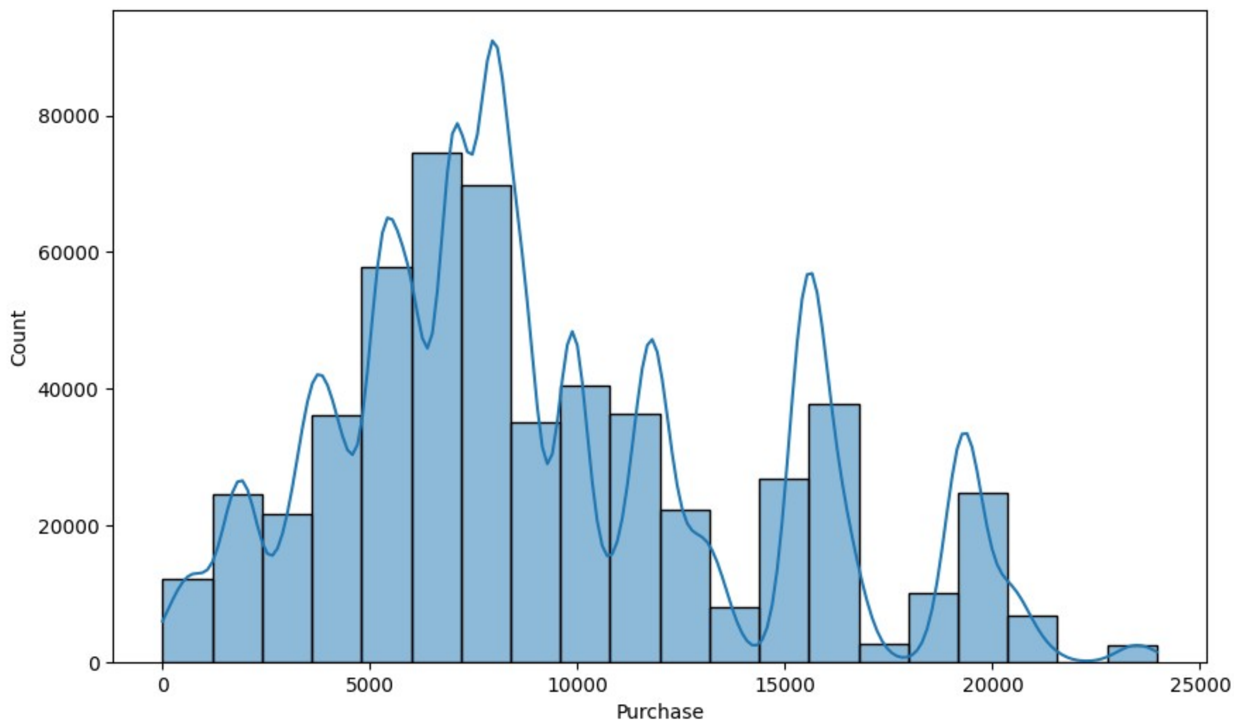
```
User_ID                       0
Product_ID                    0
Gender                        0
Age                           0
Occupation                    0
```

```
City_Category                 0
Stay_In_Current_City_Years    0
Marital_Status                0
Product_Category              0
Purchase                      0
dtype: int64
```

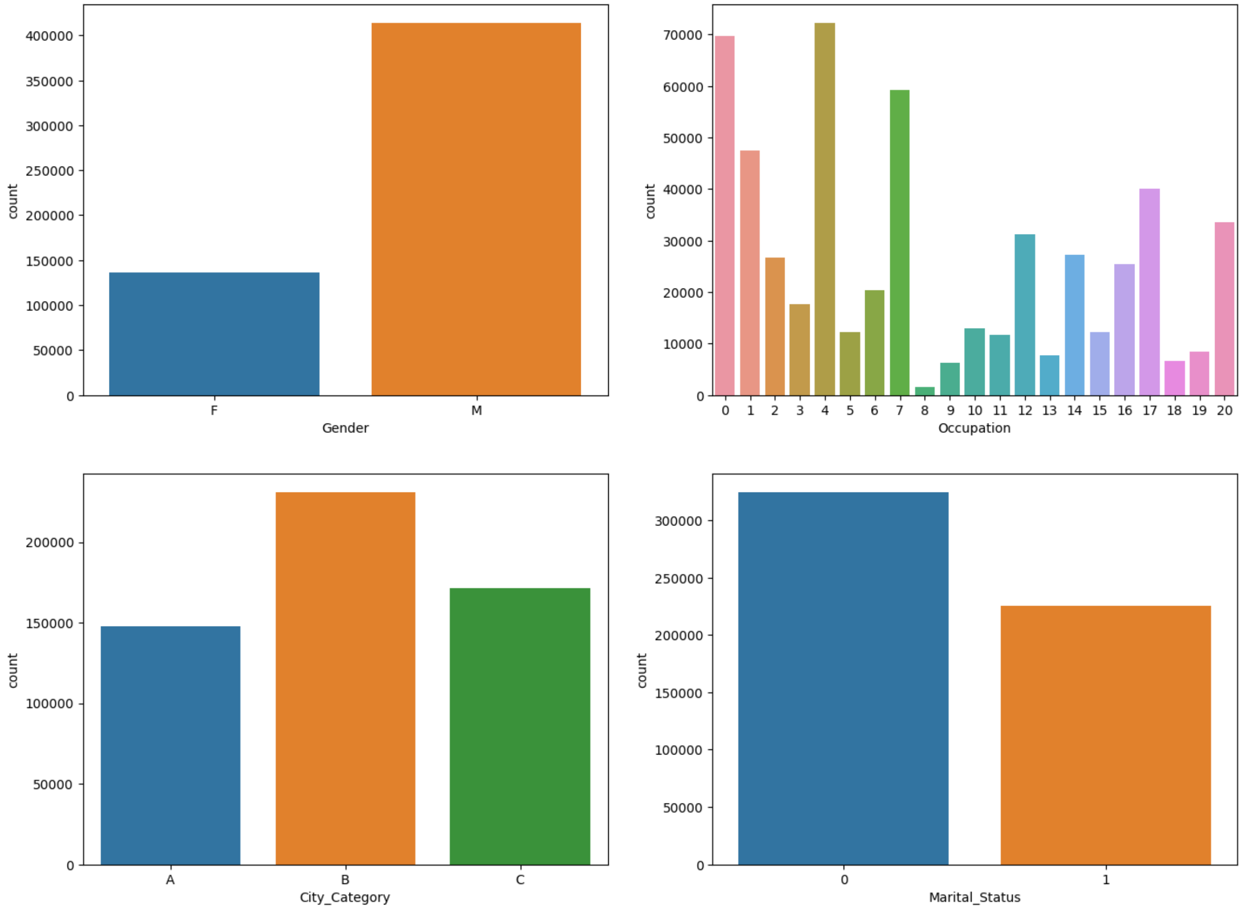
The dataset contains no null values or missing values

Univariate Analysis

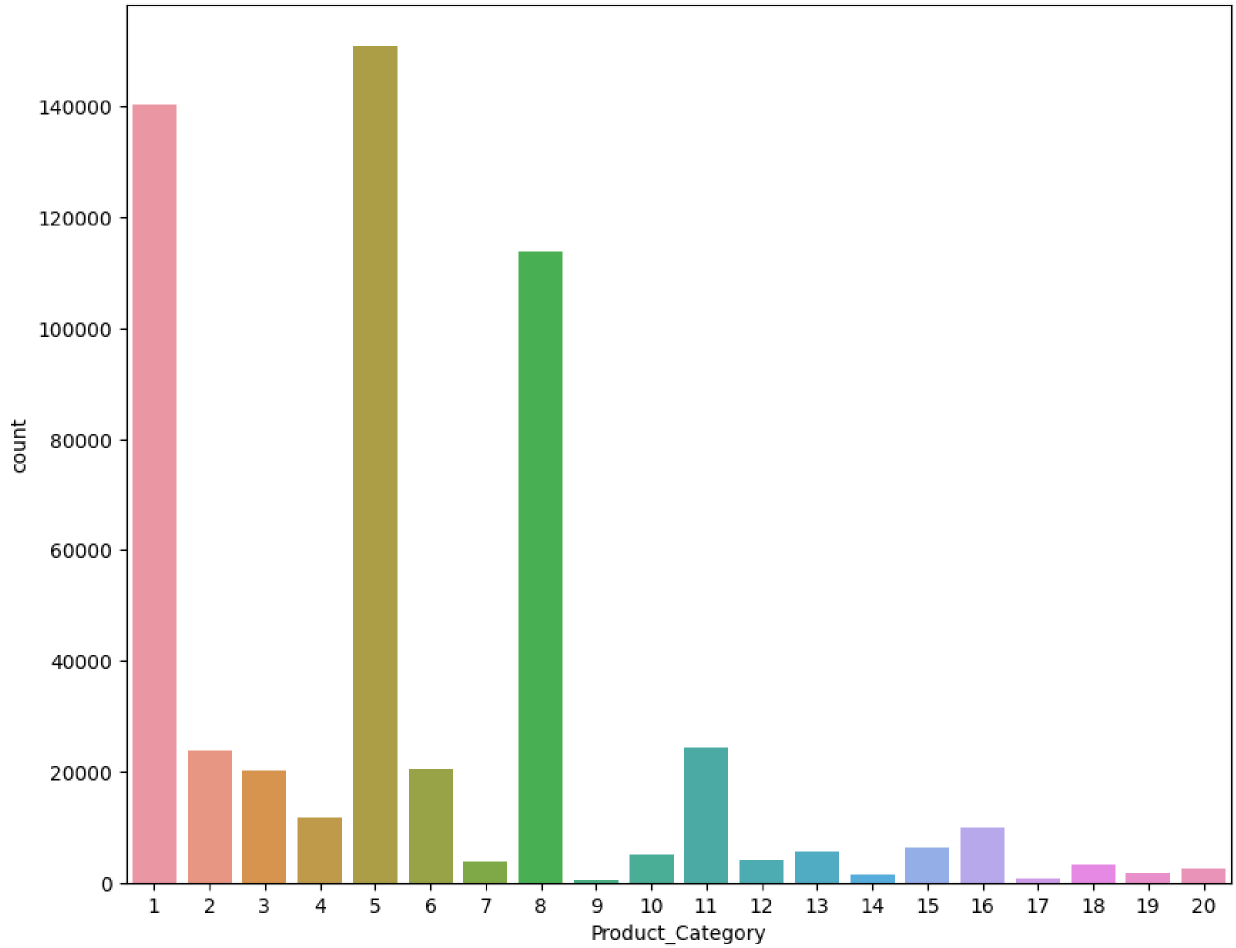
```
plt.figure(figsize=(10, 6))
sns.histplot(data=df, x='Purchase', kde=True,bins=20)
plt.show()
```




```
fig, axs = plt.subplots(nrows=2, ncols=2, figsize=(16, 12))
sns.countplot(data=df, x='Gender', ax=axs[0,0])
sns.countplot(data=df, x='Occupation', ax=axs[0,1])
sns.countplot(data=df, x='City_Category', ax=axs[1,0])
sns.countplot(data=df, x='Marital_Status', ax=axs[1,1])
plt.show()
```




```
plt.figure(figsize=(10, 8))
sns.countplot(data=df, x='Product_Category')
plt.show()
```



Most of the users are Male

There are 20 different types of Occupation and Product_Category

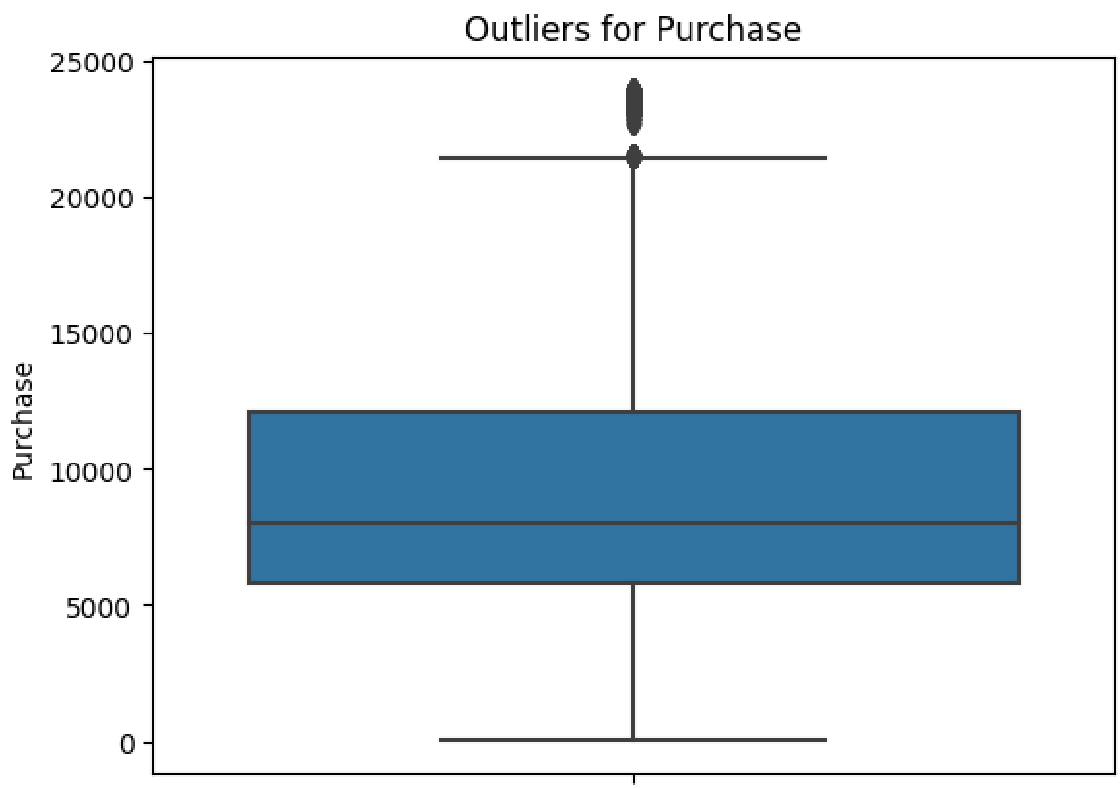
More users belong to B City_Category

More users are Single as compare to Married

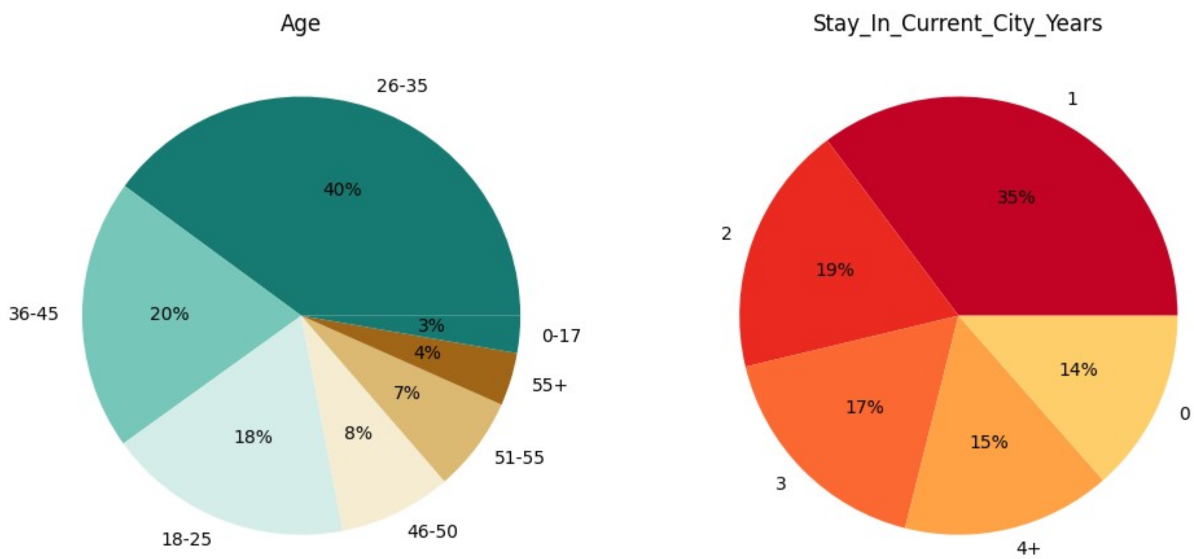
Product_Category - 1, 5, 8, & 11 have highest purchasing frequency.

```
#checking outliers
sns.boxplot(y="Purchase",data=df)
plt.title("Outliers for Purchase")
```

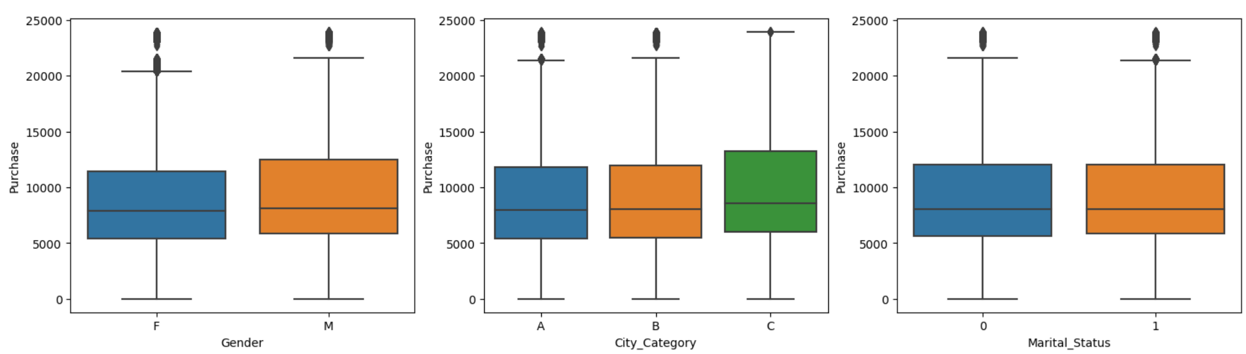
```
Text(0.5, 1.0, 'Outliers for Purchase')
```



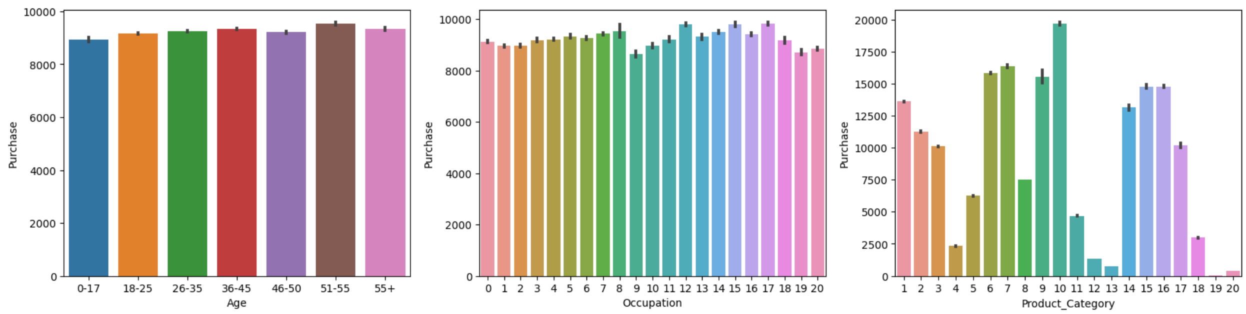

```
fig, axs = plt.subplots(nrows=1, ncols=2, figsize=(12, 8))

data = df['Age'].value_counts(normalize=True)*100
palette_color = sns.color_palette('BrBG_r')
axs[0].pie(x=data.values, labels=data.index, autopct='%.0f%%',
colors=palette_color)
axs[0].set_title("Age")

data =
df['Stay_In_Current_City_Years'].value_counts(normalize=True)*100
palette_color = sns.color_palette('YlOrRd_r')
axs[1].pie(x=data.values, labels=data.index, autopct='%.0f%%',
colors=palette_color)
axs[1].set_title("Stay_In_Current_City_Years")


plt.show()
```




```
plt.figure(figsize=(18,10))
plt.subplot(2,3,1)
sns.boxplot(x="Gender",y="Purchase",data=df)
plt.subplot(2,3,2)
sns.boxplot(x="City_Category",y="Purchase",data=df)
plt.subplot(2,3,3)
sns.boxplot(x="Marital_Status",y="Purchase",data=df)

<Axes: xlabel='Marital_Status', ylabel='Purchase'>
```




```
plt.figure(figsize=(20,10))
plt.subplot(2,3,1)
sns.barplot(x="Age",y="Purchase",data=df)
plt.subplot(2,3,2)
sns.barplot(x="Occupation",y="Purchase",data=df)
plt.subplot(2,3,3)
sns.barplot(x="Product_Category",y="Purchase",data=df)

<Axes: xlabel='Product_Category', ylabel='Purchase'>
```



Most of the users are Male with count of 412171 users

There are 20 different types of Occupation and Product_Category

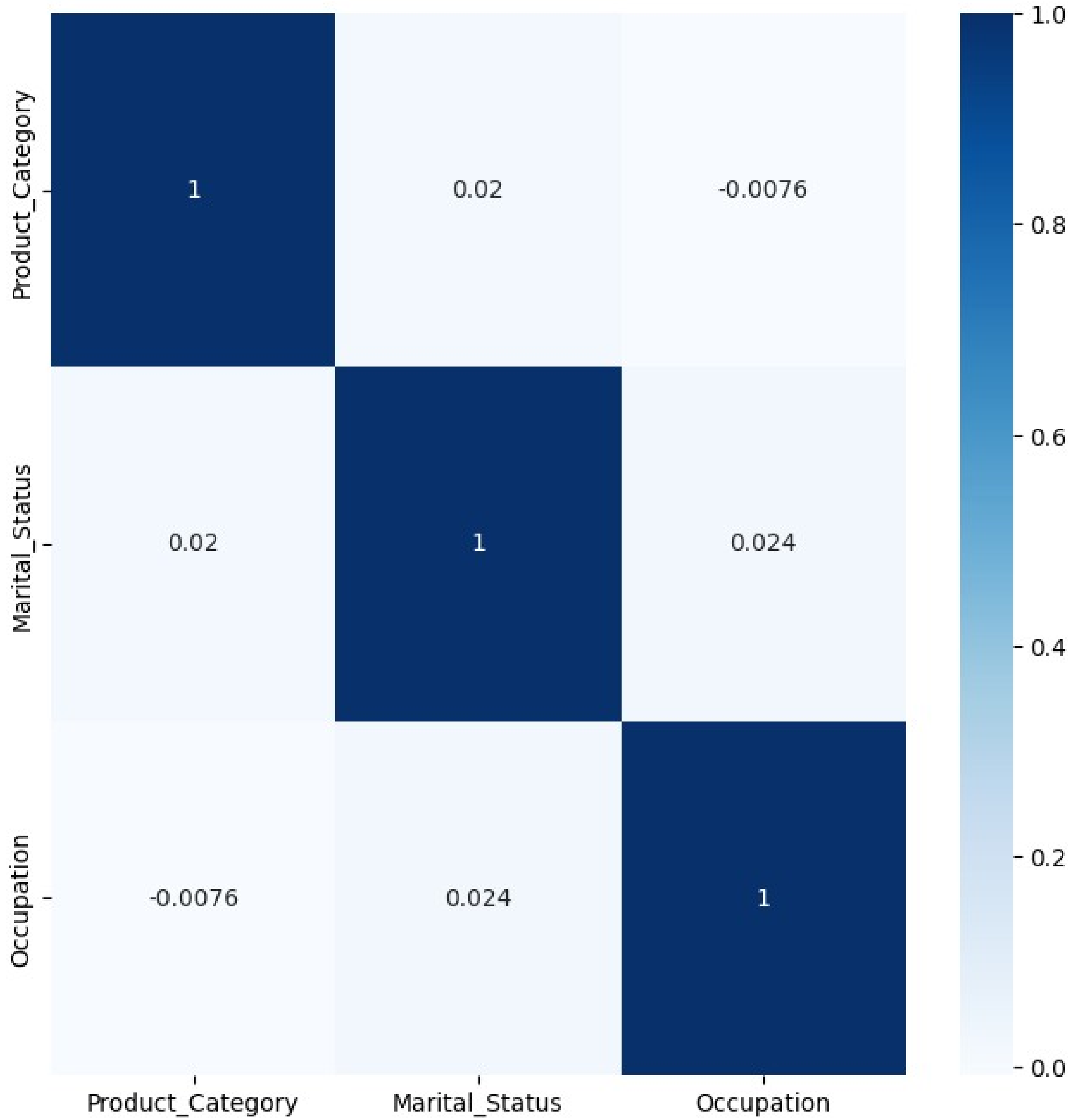
More users belong to B City_Category with count of 230114

More users are Single as compare to Married with count of 323242

Product_Category - 1, 5, 8, & 11 have highest purchasing frequency.

Most purchases are made from the age group of (26-35) with count of 218661

```
plt.figure(figsize=(8, 8))
map=df[["Product_Category","Marital_Status","Occupation"]]
sns.heatmap(map.corr(),cmap="Blues",annot=True)
plt.show()
```




```
df.groupby("Gender")["Purchase"].mean()

Gender
F    8734.565765
M    9437.526040
Name: Purchase, dtype: float64

df_male=df[df["Gender"]=="M"]
df_female=df[df["Gender"]=="F"]

df[df.Gender=="M"]["Purchase"].mean()
```

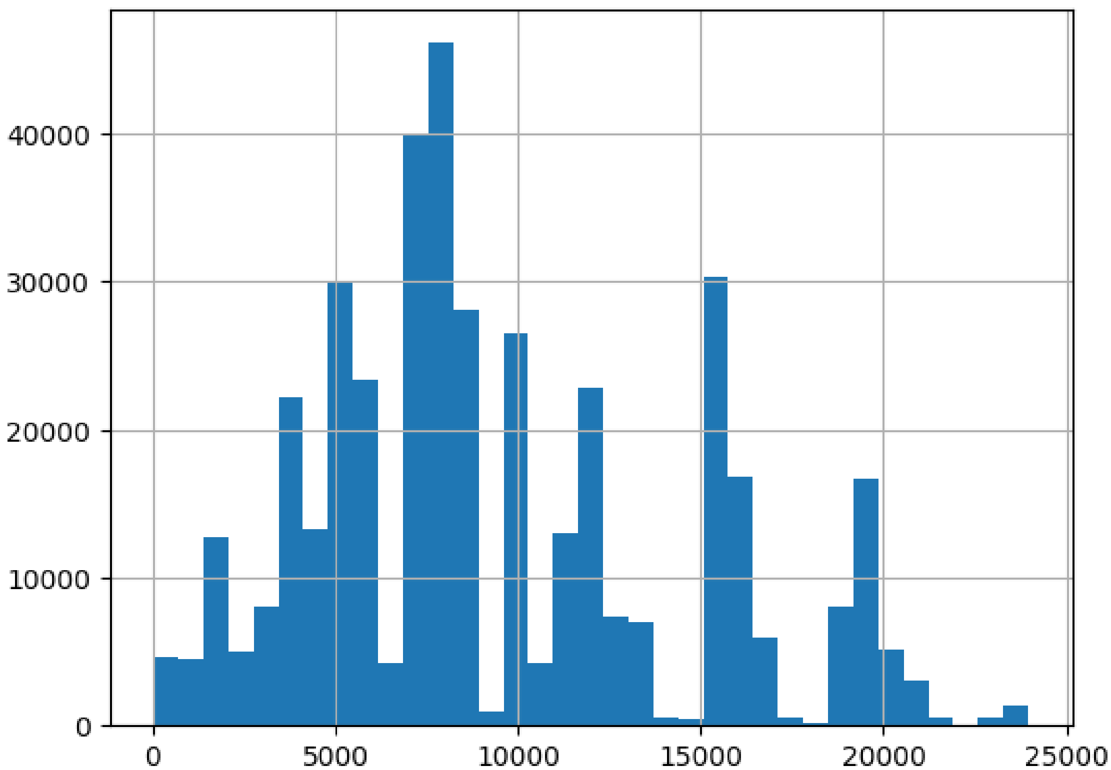
```
9437.526040472265
```

```
df[df.Gender=="F"]["Purchase"].mean()
```

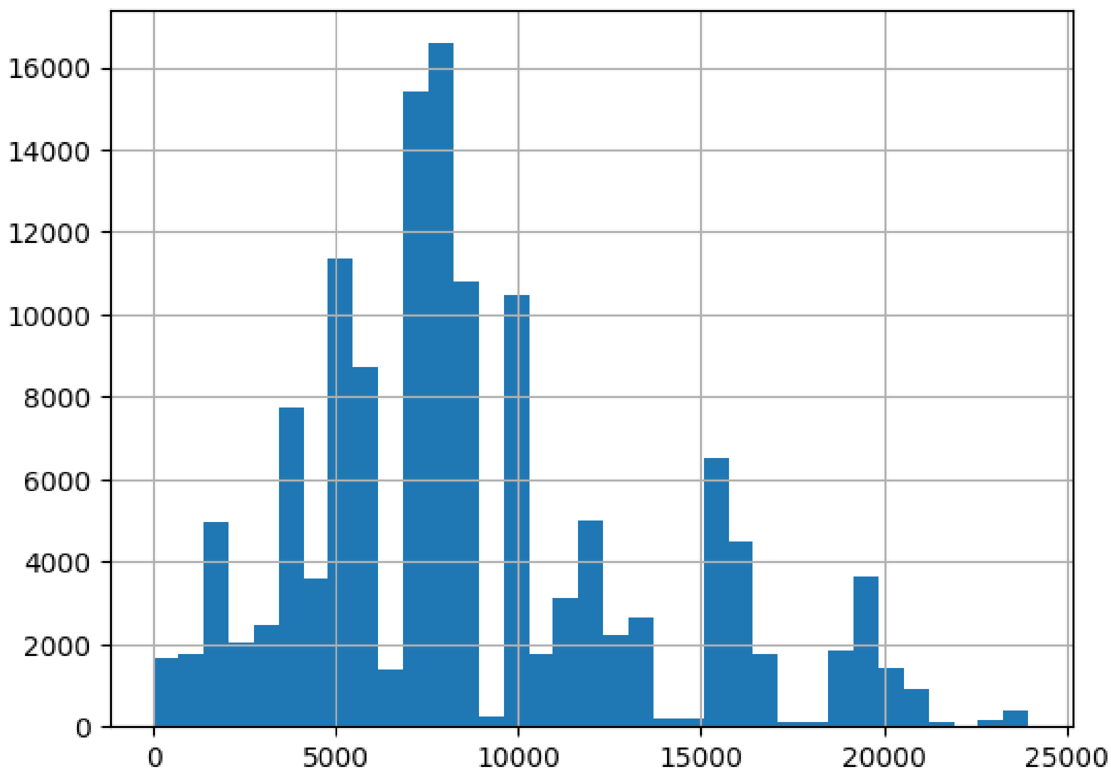
```
8734.565765155476
```

Male customers spend more money than female customers

```
df[df.Gender=="M"]["Purchase"].hist(bins=35)
plt.show()
```



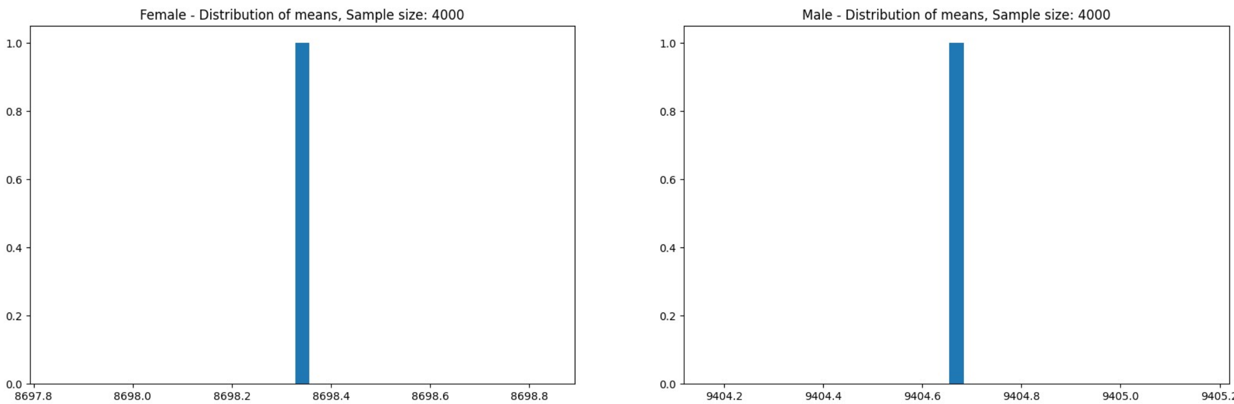

```
df[df.Gender=="F"]["Purchase"].hist(bins=35)
plt.show()
```



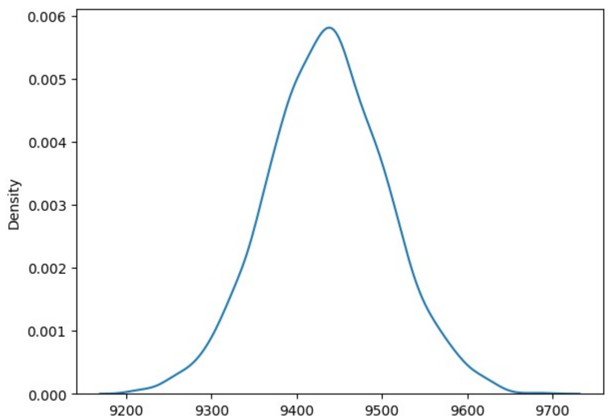

```
df_male = df[df['Gender']=='M']
df_female= df[df['Gender']=='F']

#Calculating interval of a female sample where population mean will
lie
sample_female_mean=(df_female["Purchase"].sample(4000)).mean()
sample_female_std=(df_female["Purchase"].sample(4000)).std()
stderr=sample_female_std/(np.sqrt(4000))
me=stderr*1.96
print(sample_female_mean-me,sample_female_mean+me)

8550.261037571607 8846.423462428393

#Calculating interval of a female sample where population mean will
lie
sample_male_mean=(df_male["Purchase"].sample(4000)).mean()
sample_male_std=(df_male["Purchase"].sample(4000)).std()
stderr=sample_male_std/(np.sqrt(4000))
me=stderr*1.96
print(sample_male_mean-me,sample_male_mean+me)

9247.907313582273 9561.430686417727
```

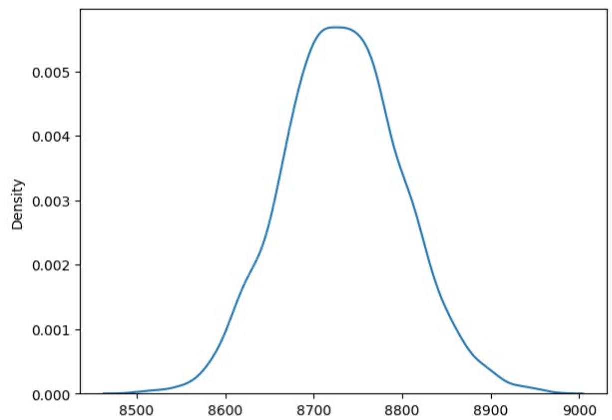
Now we can infer about the population that, 95% of the times:

```
fig, axis = plt.subplots(nrows=1, ncols=2, figsize=(20, 6))

axis[0].hist(sample_female_mean, bins=35)
axis[1].hist(sample_male_mean, bins=35)
axis[0].set_title("Female - Distribution of means, Sample size: 4000")
axis[1].set_title("Male - Distribution of means, Sample size: 4000")
plt.show()
```




```
 #Using central limit theorem based on the catagories of Gender 0f
sample size 5000
df_male_means=[]
df_female_means=[]
sample_size=5000
n=2000
for i in range(n):
  male_mean = df[df['Gender']=="M"].sample(sample_size, replace=True)
['Purchase'].mean()
  female_mean = df[df['Gender']=="F"].sample(sample_size,
replace=True)['Purchase'].mean()
  df_male_means.append(male_mean)
  df_female_means.append(female_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=df_male_means)
plt.subplot(1,2,2)
sns.kdeplot(x=df_female_means)

<Axes: ylabel='Density'>
```





FEMALE DATA for 5000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(5000))
z=norm.ppf(0.9)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8648.165019924947 8820.966510386004
```

```
#confidence interval for 95%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(5000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8623.671609208383 8845.459921102569
```

```
#confidence interval for 99%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(5000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8577.72604415902 8891.40548615193
```

MALE DATA for 5000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
```

```
se=s/(np.sqrt(5000))
z=norm.ppf(0.9)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9345.235888789164 9529.816192155366
```

```
#confidence interval for 95%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(5000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

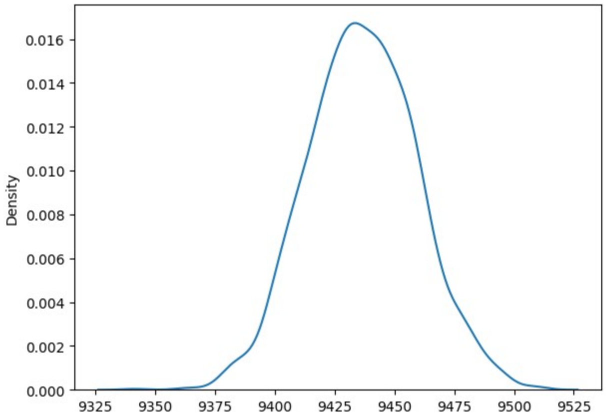
```
9319.072913177819 9555.97916776671
```

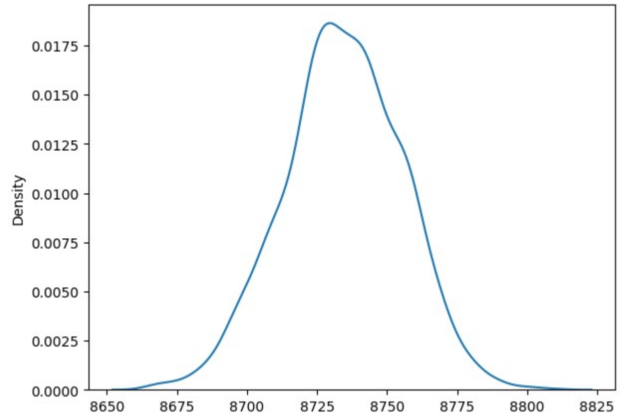
```
#confidence interval for 99%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(5000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9269.995522048177 9605.056558896353
```

```
 #Using central limit theorem based on the catagories of Gender 0f
sample size 50000
df_male_means=[]
df_female_means=[]
sample_size=50000
n=2000
for i in range(n):
  male_mean = df[df['Gender']=="M"].sample(sample_size, replace=True)
['Purchase'].mean()
  female_mean = df[df['Gender']=="F"].sample(sample_size,
replace=True)['Purchase'].mean()
  df_male_means.append(male_mean)
  df_female_means.append(female_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=df_male_means)
plt.subplot(1,2,2)
sns.kdeplot(x=df_female_means)
```

```
<Axes: ylabel='Density'>
```





FEMALE DATA FOR 50000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(50000))
z=norm.ppf(0.9)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8707.243450509035 8761.888079801916
```

```
#confidence interval for 95%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(50000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8699.497953956003 8769.633576354949
```

```
#confidence interval for 99%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(50000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8684.968690562062 8784.16283974889
```

MALE DATA FOR 50000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
```

```
se=s/(np.sqrt(50000))
z=norm.ppf(0.9)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9408.341331980162 9466.710748964368
```

```
#confidence interval for 95%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(50000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

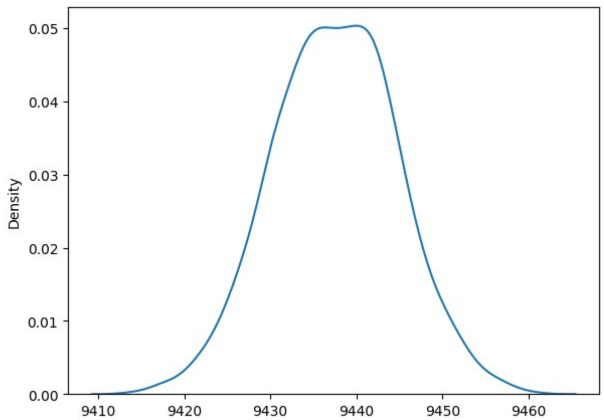
```
9400.067872650234 9474.984208294296
```

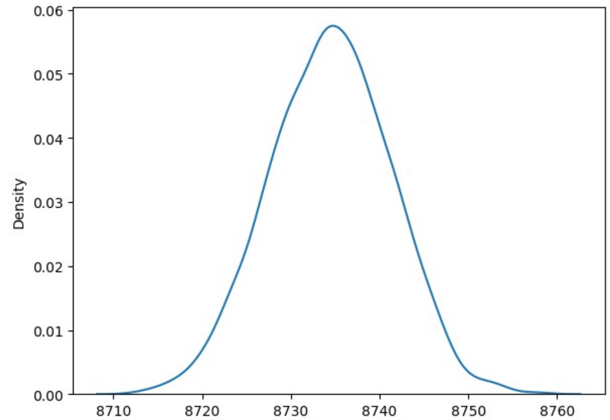
```
#confidence interval for 99%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(50000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8684.968690562062 8784.16283974889
```

```
 #Using central limit theorem based on the catagories of Gender 0f
sample size 500000
df_male_means=[]
df_female_means=[]
sample_size=500000
n=2000
for i in range(n):
  male_mean = df[df['Gender']=="M"].sample(sample_size, replace=True)
['Purchase'].mean()
  female_mean = df[df['Gender']=="F"].sample(sample_size,
replace=True)['Purchase'].mean()
  df_male_means.append(male_mean)
  df_female_means.append(female_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=df_male_means)
plt.subplot(1,2,2)
sns.kdeplot(x=df_female_means)
```

```
<Axes: ylabel='Density'>
```





FEMALE DATA FOR 500000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(500000))
z=norm.ppf(0.90)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8725.925690632423 8743.205839678529
```

```
#confidence interval for 95%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(500000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8723.476349560766 8745.655180750186
```

```
#confidence interval for 99%
f_mean=df[df["Gender"]=="F"]["Purchase"].mean()
s=df[df["Gender"]=="F"]["Purchase"].std()
se=s/(np.sqrt(500000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
8718.88179305583 8750.24973725512
```

MALE DATA FOR 500000

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
```

```
se=s/(np.sqrt(500000))
z=norm.ppf(0.90)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9428.297025303955 9446.755055640575
```

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(500000))
z=norm.ppf(0.95)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9425.68072774282 9449.37135320171
```

```
#confidence interval for 90%
f_mean=df[df["Gender"]=="M"]["Purchase"].mean()
s=df[df["Gender"]=="M"]["Purchase"].std()
se=s/(np.sqrt(500000))
z=norm.ppf(0.99)
me=se*z
print(f_mean-me,f_mean+me)
```

```
9420.772988629857 9454.279092314673
```

Female Analysis

Sample size=5000

For 90% confidance interval the range is (8648.165,8820.966)

For 95% confidance interval the range is (8623.617,8845.459)

For 99% confidance interval the range is (8577.726,8891.405)

Sample size=50000

For 90% confidance interval the range is (8707.243,8761.888)

For 95% confidance interval the range is (8699.497,8769.633)

For 99% confidance interval the range is (8684.968,8784.162)

Sample size=500000

For 90% confidance interval the range is (8725.925,8743.205)

For 95% confidance interval the range is (8723.476,8745.655)

For 99% confidance interval the range is (8718.881,8750.249)

Male Analysis

Sample size=5000 816 For 90% confidance interval the range is (9345.235,9529.816)

For 95% confidance interval the range is (9319.072,9555.979)

For 99% confidance interval the range is (9269.995,9605.056)

Sample size=50000

For 90% confidance interval the range is (9408.341,9466.710)

For 95% confidance interval the range is (9400.0678,9474.984)

For 99% confidance interval the range is (8684.968,8784.162)

Sample size=500000

For 90% confidance interval the range is (9428.297,9446.755)

For 95% confidance interval the range is (9425.680,9449.371)

For 99% confidance interval the range is (9420.772,9454.279)

MARITAL STATUS ANALYSIS

```
#Average based on Marital status
df.groupby("Marital_Status")["Purchase"].mean()
```

```
Marital_Status
0    9265.907619
1    9261.174574
Name: Purchase, dtype: float64
```

```
df_unmarried=df[df["Marital_Status"]==0]
df_married=df[df["Marital_Status"]==1]
```

```
#Unamried
df_mean_unmaried=(df_unmarried["Purchase"].sample(3000)).mean()
df_std_unmaried=(df_unmarried["Purchase"].sample(3000)).std()
se=df_std_unmaried/(np.sqrt(3000))
me=se*1.96
print(df_mean_unmaried-me,df_mean_unmaried+me)
```

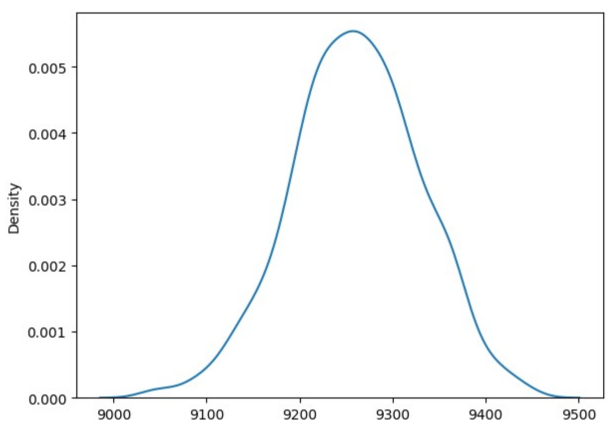
```
9112.234520876867 9471.902145789798
```

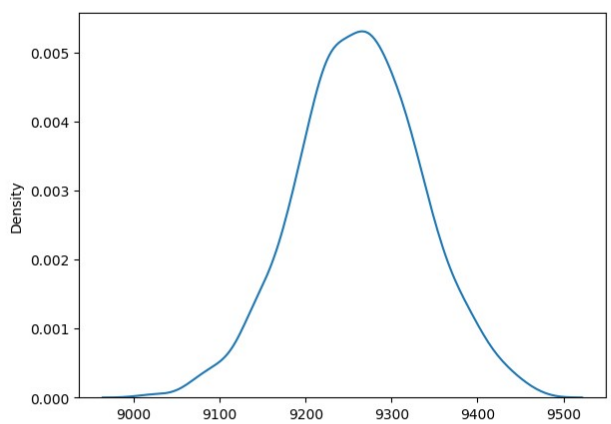
```
#Maried
df_mean_maried=(df_married["Purchase"].sample(3000)).mean()
df_std_maried=(df_married["Purchase"].sample(3000)).std()
se=df_std_unmaried/(np.sqrt(3000))
me=se*1.96
print(df_mean_maried-me,df_mean_maried+me)
```

```
9076.365520876869 9436.0331457898
```

```
# marital status 0f sample size 5000
married_means=[]
unmarried_means=[]
samp_size=5000
repetitions=1000
for i in range(repetitions):
 married_mean = df[df["Marital_Status"]==1].sample(samp_size, 
replace=True)['Purchase'].mean()
 unmarried_mean = df[df["Marital_Status"]==0].sample(samp_size, 
replace=True)['Purchase'].mean()
 married_means.append(married_mean)
 unmarried_means.append(unmarried_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=married_means)
plt.subplot(1,2,2)
sns.kdeplot(x=unmarried_means)
```

```
<Axes: ylabel='Density'>
```





MARIED ANALYSIS

```
#confidance interval of 90% for sample size 5000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(5000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9170.248947858021 9352.100200306726
```

```
#confidance interval of 95% for sample size 5000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(5000))
```

```
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9144.472796253867 9377.87635191088
```

```
#confidance interval of 99% for sample size 5000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9096.121022629712 9426.228125535035
```

UNMARIED ANALYSIS

```
#confidance interval of 90% for sample size 5000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(5000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9174.79258947701 9357.022648366003
```

```
#confidance interval of 95% for sample size 5000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9148.962744691742 9382.852493151271
```

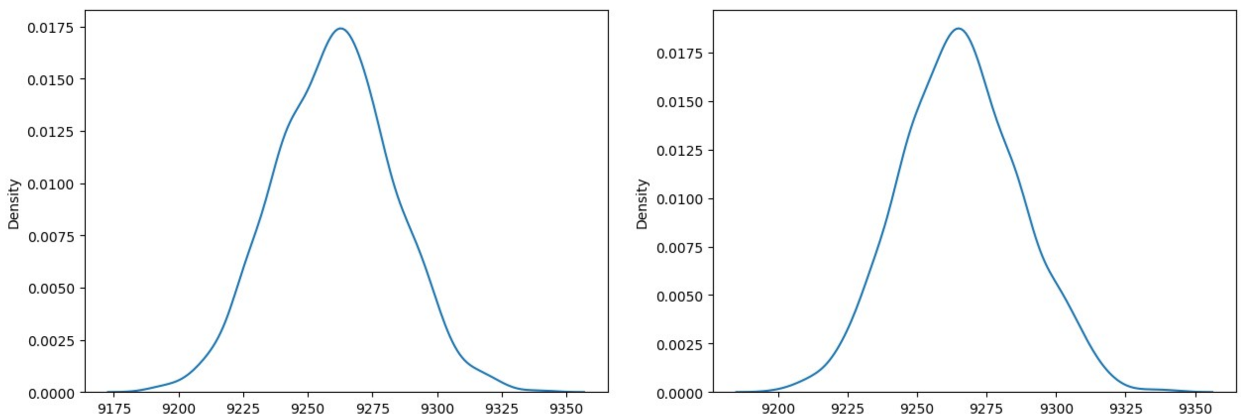
```
#confidance interval of 99% for sample size 5000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9100.510251589434 9431.304986253579
```

```
# marital status 0f sample size 50000
married_means=[]
unmarried_means=[]
samp_size=50000
repetitions=1000
for i in range(repetitions):
 married_mean = df[df["Marital_Status"]==1].sample(samp_size,
replace=True)['Purchase'].mean()
```

```
 unmarried_mean = df[df["Marital_Status"]==0].sample(samp_size,
replace=True)['Purchase'].mean()
 married_means.append(married_mean)
 unmarried_means.append(unmarried_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=married_means)
plt.subplot(1,2,2)
sns.kdeplot(x=unmarried_means)
```

```
<Axes: ylabel='Density'>
```



MARIED ANALYSIS

```
#confidance interval of 90% for sample size 50000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(50000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9232.421366427765 9289.927781736982
```

```
#confidance interval of 95% for sample size 50000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9224.270231589471 9298.078916575276
```

```
#confidance interval of 99% for sample size 50000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(50000))
```

```
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9208.980058233354 9313.369089931393
```

UNMARIED ANALYSIS

```
#confidance interval of 90% for sample size 50000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(50000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9237.094516709714 9294.720721133299
```

```
#confidance interval of 95% for sample size 50000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9228.926402596708 9302.888835246305
```

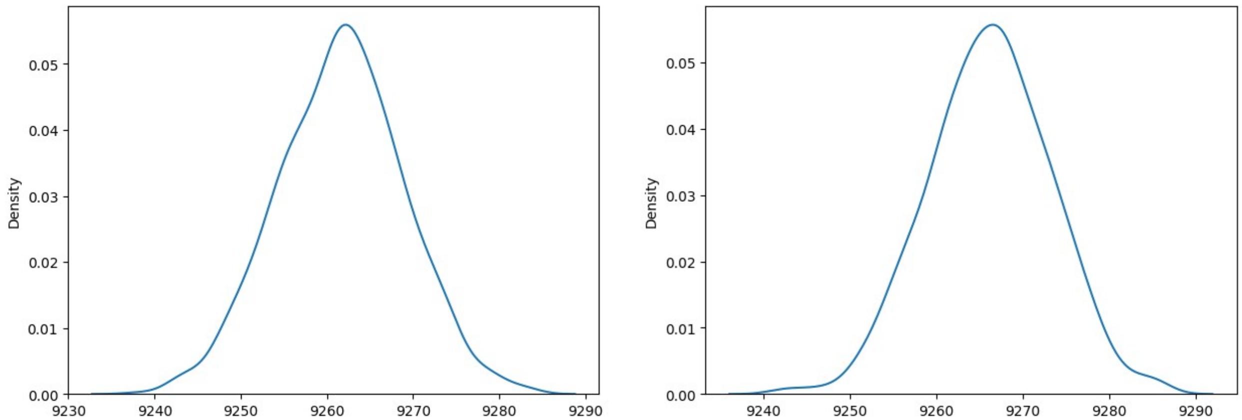
```
#confidance interval of 99% for sample size 50000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(50000))
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9213.60437894502 9318.210858897994
```

```
# marital status 0f sample size 500000
married_means=[]
unmarried_means=[]
samp_size=500000
repetitions=1000
for i in range(repetitions):
 married_mean = df[df["Marital_Status"]==1].sample(samp_size,
replace=True)['Purchase'].mean()
 unmarried_mean = df[df["Marital_Status"]==0].sample(samp_size,
replace=True)['Purchase'].mean()
 married_means.append(married_mean)
 unmarried_means.append(unmarried_mean)

plt.figure(figsize=(15,5))
plt.subplot(1,2,1)
sns.kdeplot(x=married_means)
```

```
plt.subplot(1,2,2)
sns.kdeplot(x=unmarried_means)
```

```
<Axes: ylabel='Density'>
```



MARIED ANALYSIS

```
#confidance interval of 90% for sample size 500000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9252.08201145994 9270.267136704808
```

```
#confidance interval of 95% for sample size 500000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9249.504396299522 9272.844751865225
```

```
#confidance interval of 99% for sample size 500000 of married
m_mean=df[df["Marital_Status"]==1]["Purchase"].mean()
s=df[df["Marital_Status"]==1]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9244.669218937108 9277.67992922764
```

UNMARIED ANALYSIS

```
#confidance interval of 90% for sample size 500000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.90)
print(m_mean-me,m_mean+me)
```

```
9256.796115977057 9275.019121865957
```

```
#confidance interval of 95% for sample size 500000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(m_mean-me,m_mean+me)
```

```
9254.21313149853 9277.602106344482
```

```
#confidance interval of 99% for sample size 500000 of unmarried
m_mean=df[df["Marital_Status"]==0]["Purchase"].mean()
s=df[df["Marital_Status"]==0]["Purchase"].std()
se=s/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(m_mean-me,m_mean+me)
```

```
9249.367882188299 9282.447355654715
```

Married Analysis

Sample size=5000

For 90% confidance interval the range is (9170.248,9352.100)

For 95% confidance interval the range is (9144.472,9377.876)

For 99% confidance interval the range is (9096.121,9426.228)

Sample size=50000

For 90% confidance interval the range is (9232.421,9289.927)

For 95% confidance interval the range is (9222.270,9298.078)

For 99% confidance interval the range is (9208.980,9313.3690)

Sample size=500000

For 90% confidance interval the range is (9252.082,9270.267)

For 95% confidance interval the range is (9249.504,9272.844)

For 99% confidance interval the range is (9244.669,9277.679)

Unmarried Analysis

Sample size=5000

For 90% confidance interval the range is (9174.792,9357.022)

For 95% confidance interval the range is (9148.962,9382.852)

For 99% confidance interval the range is (9100.510,9431.304)

Sample size=50000

For 90% confidance interval the range is (9237.094,9294.720)

For 95% confidance interval the range is (9228.926,9302.888)

For 99% confidance interval the range is (9213.604,9318.210)

Sample size=500000

For 90% confidance interval the range is (9256.796,9257.019)

For 95% confidance interval the range is (9257.213,9277.602)

For 99% confidance interval the range is (9249.367,9282.447)

AGE BASED ANALYSIS

```
df.groupby("Age")["Purchase"].mean()
```

```
Age
0-17     8933.464640
18-25    9169.663606
26-35    9252.690633
36-45    9331.350695
46-50    9208.625697
51-55    9534.808031
55+      9336.280459
Name: Purchase, dtype: float64
```

```
df_a1=df[df["Age"]=="0-17"]
df_a2=df[df["Age"]=="18-25"]
df_a3=df[df["Age"]=="26-35"]
df_a4=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
df_a5=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]
```

```
#Calculating interval of age 0-17 group sample where population mean
will lie
df_a1_mean=(df_a1["Purchase"].sample(3000)).mean()
df_a1_std=(df_a1["Purchase"].sample(3000)).std()
se=df_a1_std/(np.sqrt(3000))
me=se*1.96
print(df_a1_mean-me,df_a1_mean+me)
```

```
8786.920961238902 9146.749705427763
```

```
#Calculating interval of age 18-25 group sample where population mean will lie
df_a2_mean=(df_a2["Purchase"].sample(3000)).mean()
df_a2_std=(df_a2["Purchase"].sample(3000)).std()
se=df_a2_std/(np.sqrt(3000))
me=se*1.96
print(df_a2_mean-me,df_a2_mean+me)
```

```
8894.78557756834 9256.046422431658
```

```
#Calculating interval of age 26-35 group sample where population mean will lie
df_a3_mean=(df_a3["Purchase"].sample(3000)).mean()
df_a3_std=(df_a3["Purchase"].sample(3000)).std()
se=df_a3_std/(np.sqrt(3000))
me=se*1.96
print(df_a3_mean-me,df_a3_mean+me)
```

```
9062.735540492615 9421.637126174051
```

```
#Calculating interval of age 45-50 group sample where population mean will lie
df_a4_mean=(df_a4["Purchase"].sample(3000)).mean()
df_a4_std=(df_a4["Purchase"].sample(3000)).std()
se=df_a4_std/(np.sqrt(3000))
me=se*1.96
print(df_a4_mean-me,df_a4_mean+me)
```

```
9289.043950703455 9647.850049296545
```

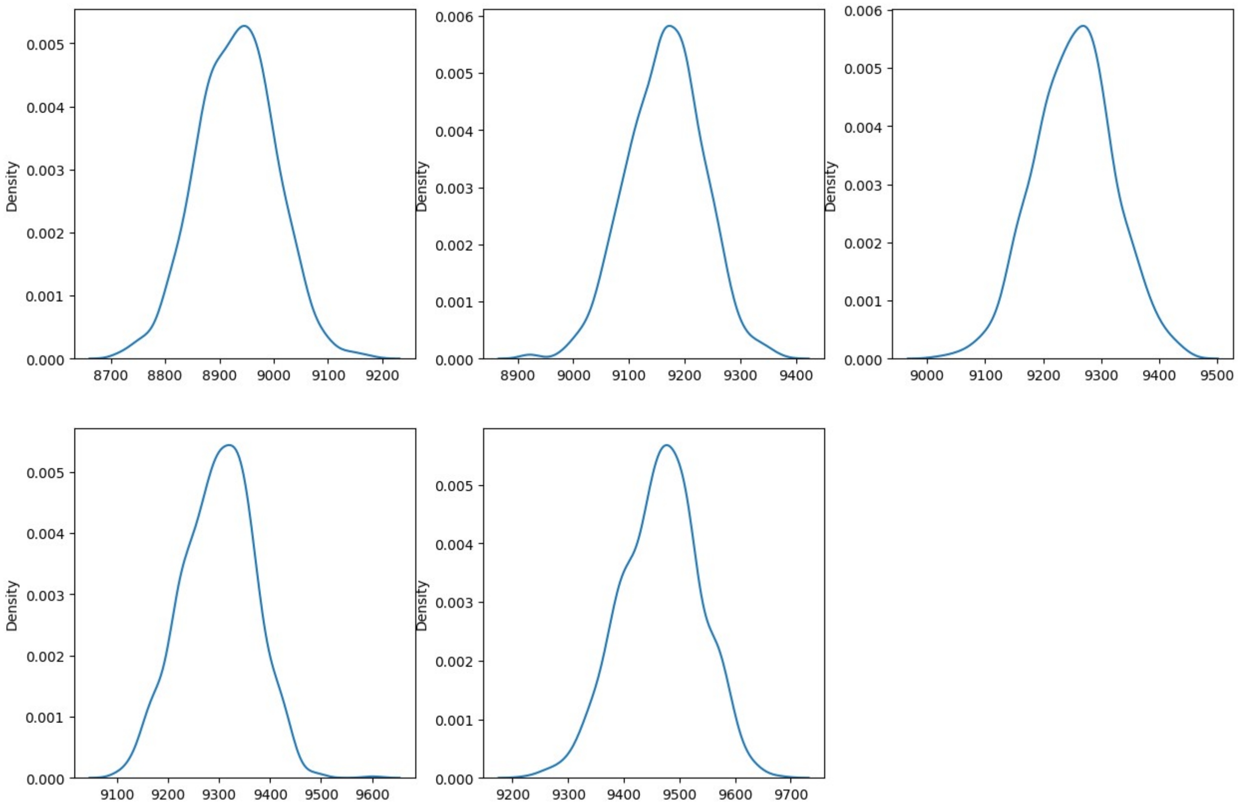
```
#Calculating interval of age 55+ group sample where population mean will lie
df_a5_mean=(df_a5["Purchase"].sample(3000)).mean()
df_a5_std=(df_a5["Purchase"].sample(3000)).std()
se=df_a5_std/(np.sqrt(3000))
me=se*1.96
print(df_a5_mean-me,df_a5_mean+me)
```

```
9478.95810988317 9834.818556783499
```

```
#Using central limit theorem based on the catagories of Age 0f sample size 5000
Age_0_17_means=[]
Age_18_25_means=[]
Age_26_35_means=[]
Age_36_50_means=[]
Age_51_means=[]
samp_size=5000
n=1000
for i in range(n):
 Age_0_17_mean = df[df["Age"]=="0-17"].sample(samp_size, replace=True)
```

```
['Purchase'].mean()
 Age_18_25_mean = df[df["Age"]=="18-25"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_26_35_mean = df[df["Age"]=="26-35"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_36_50_mean = df[(df["Age"]=="36-45")|(df["Age"]=="46-
50")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_51_mean = df[(df["Age"]=="51-55")|
(df["Age"]=="55+")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_0_17_means.append(Age_0_17_mean)
 Age_18_25_means.append(Age_18_25_mean)
 Age_26_35_means.append(Age_26_35_mean)
 Age_36_50_means.append(Age_36_50_mean)
 Age_51_means.append(Age_51_mean)

plt.figure(figsize=(15,10))
plt.subplot(2,3,1)
sns.kdeplot(x=Age_0_17_means)
plt.subplot(2,3,2)
sns.kdeplot(x=Age_18_25_means)
plt.subplot(2,3,3)
sns.kdeplot(x=Age_26_35_means)
plt.subplot(2,3,4)
sns.kdeplot(x=Age_36_50_means)
plt.subplot(2,3,5)
sns.kdeplot(x=Age_51_means)
```

```
<Axes: ylabel='Density'>
```



Age 0-17 Analysis

```
#confidance interval of 90% for sample size 5000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
8840.831443004265 9026.097837885683
```

```
#confidance interval of 95% for sample size 5000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
8814.57121868733 9052.358062202618
```

```
#confidance interval of 99% for sample size 5000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
8765.311405159257 9101.617875730692
```

Age 18-25 Analysis

```
#confidance interval of 90% for sample size 5000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9078.422178395032 9260.905034127545
```

```
#confidance interval of 95% for sample size 5000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9052.55650141353 9286.770711109048
```

```
#confidance interval of 99% for sample size 5000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9004.036793070269 9335.290419452309
```

Age 26-35 Analysis

```
#confidance interval of 90% for sample size 5000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9161.880457091453 9343.500808648323
```

```
#confidance interval of 95% for sample size 5000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9136.137034084508 9369.244231655268
```

```
#confidance interval of 99% for sample size 5000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9087.846653865685 9417.53461187409
```

Age 35-50 Analysis

```
#confidance interval of 90% for sample size 5000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9204.586685746124 9386.076799874949
```

```
#confidance interval of 95% for sample size 5000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9178.861722989768 9411.801762631305
```

```
#confidance interval of 99% for sample size 5000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9130.605971130955 9460.057514490118
```

Age 55+ Analysis

```
#confidance interval of 90% for sample size 5000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9371.933814937553 9555.389541449416
```

```
#confidance interval of 95% for sample size 5000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9345.930240282196 9581.393116104773
```

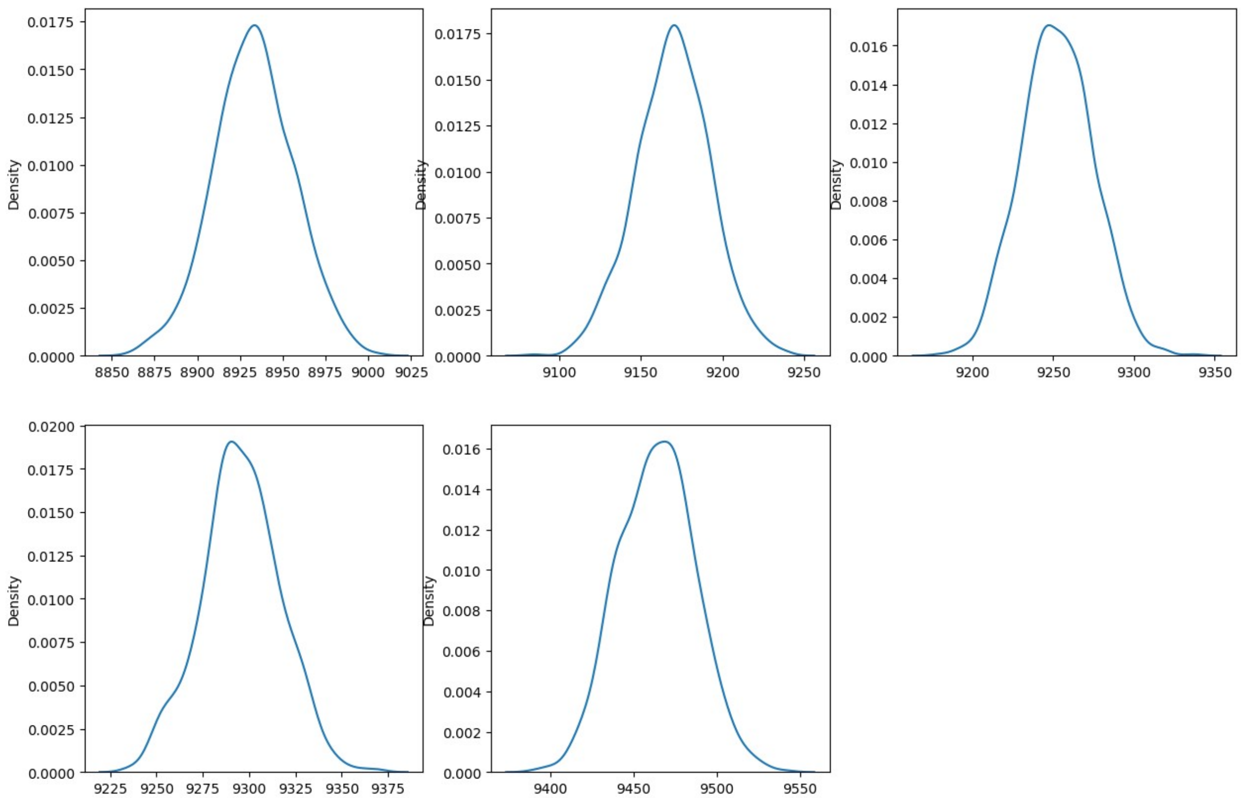
```
#confidance interval of 99% for sample size 5000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(5000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9297.151858836301 9630.171497550667
```

```
#Using central limit theorem based on the catagories of Age 0f sample
size 50000
Age_0_17_means=[]
Age_18_25_means=[]
Age_26_35_means=[]
Age_36_50_means=[]
Age_51_means=[]
samp_size=50000
repetitions=1000
for _ in range(repetitions):
 Age_0_17_mean = df[df["Age"]=="0-17"].sample(samp_size, replace=True)
['Purchase'].mean()
 Age_18_25_mean = df[df["Age"]=="18-25"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_26_35_mean = df[df["Age"]=="26-35"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_36_50_mean = df[(df["Age"]=="36-45")|(df["Age"]=="46-
50")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_51_mean = df[(df["Age"]=="51-55")|
(df["Age"]=="55+")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_0_17_means.append(Age_0_17_mean)
 Age_18_25_means.append(Age_18_25_mean)
 Age_26_35_means.append(Age_26_35_mean)
 Age_36_50_means.append(Age_36_50_mean)
 Age_51_means.append(Age_51_mean)

plt.figure(figsize=(15,10))
plt.subplot(2,3,1)
sns.kdeplot(x=Age_0_17_means)
plt.subplot(2,3,2)
sns.kdeplot(x=Age_18_25_means)
```

```
plt.subplot(2,3,3)
sns.kdeplot(x=Age_26_35_means)
plt.subplot(2,3,4)
sns.kdeplot(x=Age_36_50_means)
plt.subplot(2,3,5)
sns.kdeplot(x=Age_51_means)
```

```
<Axes: ylabel='Density'>
```



Age 0-17 Analysis

```
#confidance interval of 90% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
8904.171451359301 8962.757829530647
```

```
#confidance interval of 95% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
```

```
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
8895.867239288456 8971.062041601492
```

```
#confidance interval of 99% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
8880.289918502067 8986.639362387881
```

Age 18-25 Analysis

```
#confidance interval of 90% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9140.810533358956 9198.516679163622
```

```
#confidance interval of 95% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9132.631088110582 9206.696124411996
```

```
#confidance interval of 99% for sample size 50000 of 0-17
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9117.287809133404 9222.039403389173
```

Age 26-35 Analysis

```
#confidance interval of 90% for sample size 50000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
```

```
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9223.973933851878 9281.407331887898
```

```
#confidance interval of 95% for sample size 50000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9215.833148704765 9289.54811703501
```

```
#confidance interval of 99% for sample size 50000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9200.562389648063 9304.818876091713
```

Age 36-50 Analysis

```
#confidance interval of 90% for sample size 50000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9266.635636137988 9324.027849483085
```

```
#confidance interval of 95% for sample size 50000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9258.500688634678 9332.162796986395
```

```
#confidance interval of 99% for sample size 50000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
```

```
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9243.240880026902 9347.42260559417
```

Age 51+ Analysis

```
#confidance interval of 90% for sample size 50000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9434.654780914563 9492.668575472406
```

```
#confidance interval of 95% for sample size 50000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

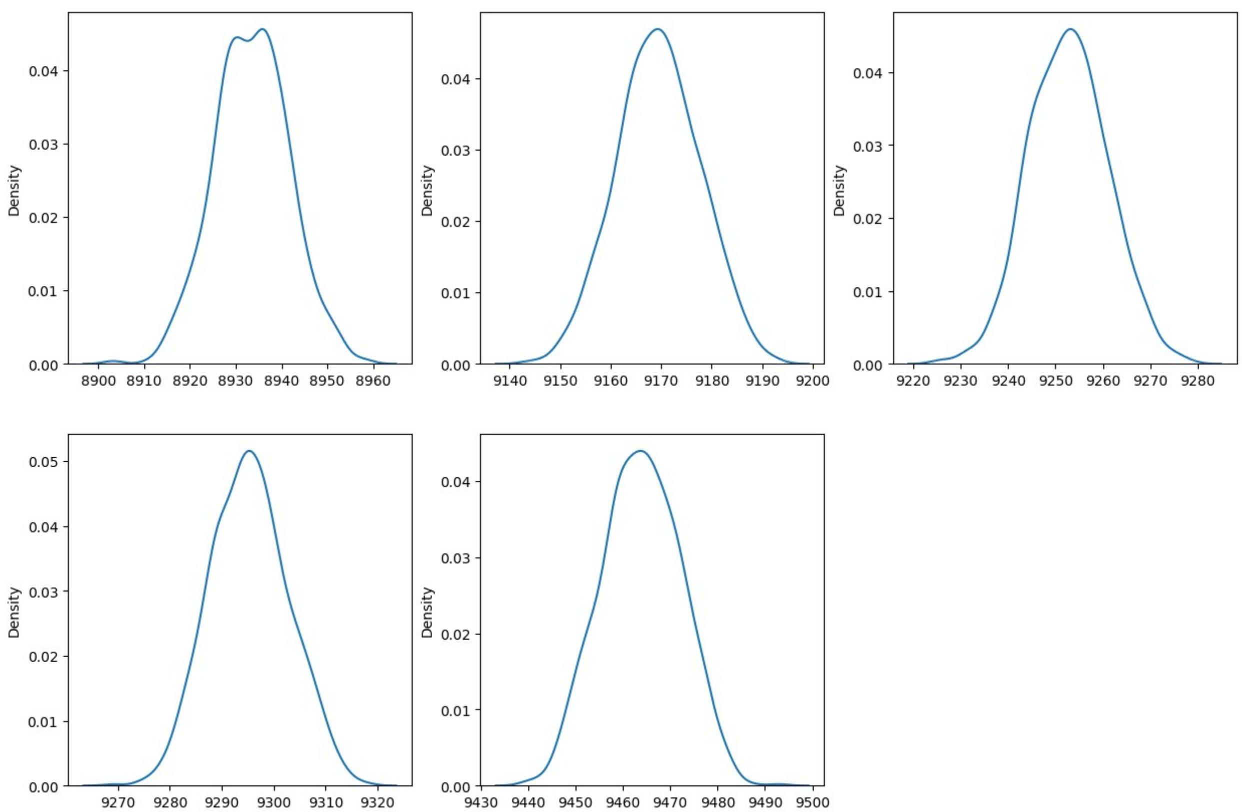
```
9426.431728592848 9500.89162779412
```

```
#confidance interval of 99% for sample size 50000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(50000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9411.006649998295 9516.316706388674
```

```
#Using central limit theorem based on the catagories of Age 0f sample
size 500000
Age_0_17_means=[]
Age_18_25_means=[]
Age_26_35_means=[]
Age_36_50_means=[]
Age_51_means=[]
samp_size=400000
n=1000
for i in range(n):
 Age_0_17_mean = df[df["Age"]=="0-17"].sample(samp_size, replace=True)
['Purchase'].mean()
 Age_18_25_mean = df[df["Age"]=="18-25"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_26_35_mean = df[df["Age"]=="26-35"].sample(samp_size,
replace=True)['Purchase'].mean()
 Age_36_50_mean = df[(df["Age"]=="36-45")|(df["Age"]=="46-
```

```
50")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_51_mean = df[(df["Age"]=="51-55")|
(df["Age"]=="55+")].sample(samp_size, replace=True)['Purchase'].mean()
 Age_0_17_means.append(Age_0_17_mean)
 Age_18_25_means.append(Age_18_25_mean)
 Age_26_35_means.append(Age_26_35_mean)
 Age_36_50_means.append(Age_36_50_mean)
 Age_51_means.append(Age_51_mean)

plt.figure(figsize=(15,10))
plt.subplot(2,3,1)
sns.kdeplot(x=Age_0_17_means)
plt.subplot(2,3,2)
sns.kdeplot(x=Age_18_25_means)
plt.subplot(2,3,3)
sns.kdeplot(x=Age_26_35_means)
plt.subplot(2,3,4)
sns.kdeplot(x=Age_36_50_means)
plt.subplot(2,3,5)
sns.kdeplot(x=Age_51_means)

<Axes: ylabel='Density'>
```



Age 0-17 Analysis

```
#confidance interval of 90% for sample size 500000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
8924.201320700902 8942.727960189046
```

```
#confidance interval of 95% for sample size 500000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
8921.57529826921 8945.353982620738
```

```
#confidance interval of 99% for sample size 500000 of 0-17
a1mean=df[df["Age"]=="0-17"]["Purchase"].mean()
a1std=df[df["Age"]=="0-17"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
8916.649316916402 8950.279963973546
```

Age 18-25 Analysis

```
#confidance interval of 90% for sample size 500000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9160.539463474663 9178.787749047915
```

```
#confidance interval of 95% for sample size 500000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9157.952895776512 9181.374316746065
```

```
#confidance interval of 99% for sample size 500000 of 18-25
a1mean=df[df["Age"]=="18-25"]["Purchase"].mean()
a1std=df[df["Age"]=="18-25"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
```

```
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9153.100924942188 9186.22628758039
```

Age 26-35 Analysis

```
#confidance interval of 90% for sample size 500000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9243.609615292044 9261.771650447732
```

```
#confidance interval of 95% for sample size 500000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9241.03527299135 9264.345992748425
```

```
#confidance interval of 99% for sample size 500000 of 26-35
a1mean=df[df["Age"]=="26-35"]["Purchase"].mean()
a1std=df[df["Age"]=="26-35"]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9236.206234969468 9269.175030770308
```

Age 36-50 Analysis

```
#confidance interval of 90% for sample size 500000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9286.257237104095 9304.406248516978
```

```
#confidance interval of 95% for sample size 500000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
```

```
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9283.68474082846 9306.978744792614
```

```
#confidance interval of 99% for sample size 500000 of 36-50
a1mean=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]
["Purchase"].mean()
a1std=df[(df["Age"]=="36-45")|(df["Age"]=="46-50")]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9278.859165642578 9311.804319978495
```

Age 51+ Analysis

```
#confidance interval of 90% for sample size 500000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.9)
print(a1mean-me,a1mean+me)
```

```
9454.488891867892 9472.834464519077
```

```
#confidance interval of 95% for sample size 500000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.95)
print(a1mean-me,a1mean+me)
```

```
9451.888534402357 9475.434821984612
```

```
#confidance interval of 99% for sample size 500000 of 51+
a1mean=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].mean()
a1std=df[(df["Age"]=="51-55")|(df["Age"]=="55+")]["Purchase"].std()
se=a1std/(np.sqrt(500000))
me=se*norm.ppf(0.99)
print(a1mean-me,a1mean+me)
```

```
9447.010696257767 9480.312660129202
```

for 5000 sample the 95% confidance interval of Age groups is for

(0-17) Age group (8814.571,9052.358)

(18-25) Age group (9052.556,9286.770)

(26-35) Age group (9136.137,9369.244)

(36-50) Age group (9178.861,9411.801)

51+ Age group (9345.930,9581.393)

for 50000 sample the 95% confidance interval of Age groups is for

(0-17) Age group (8895.867,8971.062)

(18-25) Age group (9132.631,9206.696)

(26-35) Age group (9215.833,9289.548)

(36-50) Age group (9258.500,9332.162)

51+ Age group (9426.431,9500.891)

for 500000 sample the 95% confidance interval of Age groups is for

(0-17) Age group (8921.575,8945.353)

(18-25) Age group (9157.952,9181.374)

(26-35) Age group (9241.035,9264.345)

(36-50) Age group (9283.684,9306.978)

51+ Age group (9451.888,9475.434)

Business Insights:

Most of the users are Male with count of 414259 users.

There are 21 different types of Occupation and 20 different types of Product_Category.

More users belong to B City_Category with count of 231173.

More users are Single as compare to Married with count of 324731.

Product_Category - 1, 5, 8, & 11 have highest purchasing frequency.

Most purchases are made from the age group of (26-35) with count of 219587.

We can also see that as sample size increases the standerd deveation is decreasing and overlap of the samples is also decreasing .

Average purchase of male is and female is 9437.526, 8734.56

for 5000 sample the 95% confidance interval is for male (9319.072,9555.979) and for female (8623.617,8845.459)

for 50000 sample the 95% confidance interval is for male (9400.067,9474.984) and for female (8699.497,8769.633)

for 500000 sample the 95% confidance interval is for male (9425.680,9449.371) and for female (8723.476,8745.655) for 5000 sample the 95% confidance interval is for married (9144.472,9377.876) and for unmarried (9048.23,9354.92)

for 50000 sample the 95% confidance interval is for married (9222.270,9298.078) and for unmarried (9153.08,9250.07)

for 500000 sample the 95% confidance interval is for married (9249.504,9272.844) and for unmarried (9186.24,9216.91)

for 5000 sample the 95% confidance interval of Age groups is for

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Recommendations:

Men spent more money than women, So company should focus on female customers They need to add some products related to female to attract female customers.

Product_Category - 1, 5, 8, & 11 have highest purchasing frequency. It means these are the products in these categories are liked more by customers. Company can focus on selling more of these products or selling more of the products which are purchased less.

Unmarried customers spend more money than married customers, So company should focus on married customers by adding family realted products.

Customers in the age 18-45 spend more money than the others, So company should focus on acquisition of customers who are in the age 18-45.And also need to attract other age customers by arranging the mall according to other age customer needs.

By arranging the needs related to children (0-17) so that they can increase the sales of the mall.

Male customers living in City_Category C spend more money than other male customers living in A or B, Selling more products in the City_Category C will help the company increase the revenue.