In [83]:
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import norm
```

In [2]:
```python
df = pd.read_csv("walmart.csv")
df.head()
```

Out[2]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_Years	Marital_Status	Product_Category	Purchase
0	1000001	P00069042	F	0-17	10	A	2	0	3	8370
1	1000001	P00248942	F	0-17	10	A	2	0	1	15200
2	1000001	P00087842	F	0-17	10	A	2	0	12	1422
3	1000001	P00085442	F	0-17	10	A	2	0	12	1057
4	1000002	P00285442	M	55+	16	C	4+	0	8	7969

In [3]:
```python
df.shape
```

Out[3]:
```
(550068, 10)
```

In [4]:
```
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
```

Observation:

1) No null values

2) Number of rows = 550068, Number of columns = 10

In [6]:
```
df.describe()
```

Out[6]:

	User_ID	Occupation	Marital_Status	Product_Category	Purchase
count	5.500680e+05	550068.000000	550068.000000	550068.000000	550068.000000
mean	1.003029e+06	8.076707	0.409653	5.404270	9263.968713
std	1.727592e+03	6.522660	0.491770	3.936211	5023.065394
min	1.000001e+06	0.000000	0.000000	1.000000	12.000000
25%	1.001516e+06	2.000000	0.000000	1.000000	5823.000000
50%	1.003077e+06	7.000000	0.000000	5.000000	8047.000000
75%	1.004478e+06	14.000000	1.000000	8.000000	12054.000000
max	1.006040e+06	20.000000	1.000000	20.000000	23961.000000

In [7]:
```
df.describe(include = "object")
```

Out[7]:

	Product_ID	Gender	Age	City_Category	Stay_In_Current_City_Years
count	550068	550068	550068	550068	550068
unique	3631	2	7	3	5
top	P00265242	M	26-35	B	1
freq	1880	414259	219587	231173	193821

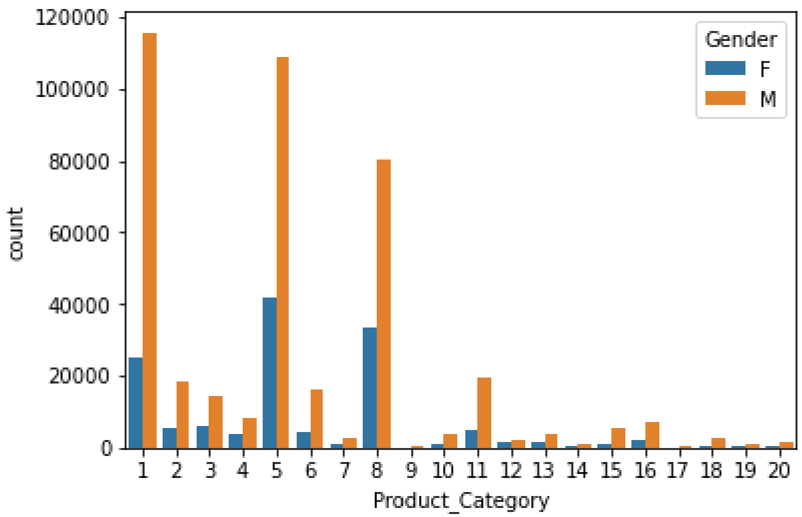
In [8]:
```
df.isnull().sum()
```

Out[8]:
```
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
```

Observation:

1) No null values.

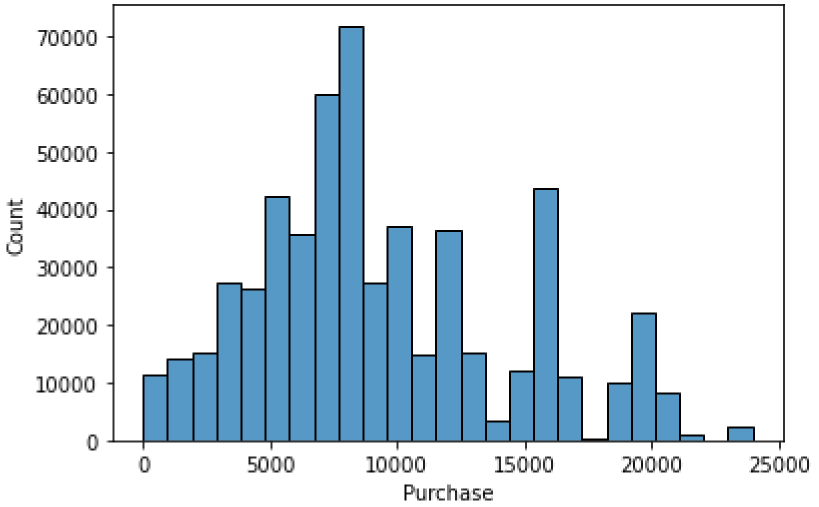
In [162]:
```
sns.countplot(data = df, x = "Product_Category",hue = "Gender")
plt.show()
```



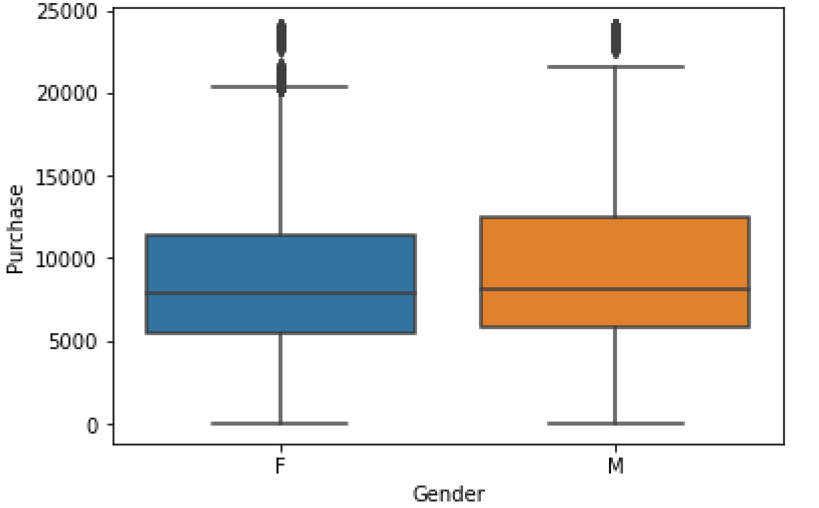
Observations:

1) Product category 1, 5, 8 are popular than other product categories.

```
In [55]: sns.histplot(data = df, x = "Purchase", bins = 25)
         plt.show()
```




```
In [9]: sns.boxplot(data = df, y = "Purchase", x = "Gender")
        plt.show()
```



In [76]:
```
df.groupby(by = "Gender")["Purchase"].describe()
```

Out[76]:

Gender	count	mean	std	min	25%	50%	75%	max
F	135809.0	8734.565765	4767.233289	12.0	5433.0	7914.0	11400.0	23959.0
M	414259.0	9437.526040	5092.186210	12.0	5863.0	8098.0	12454.0	23961.0

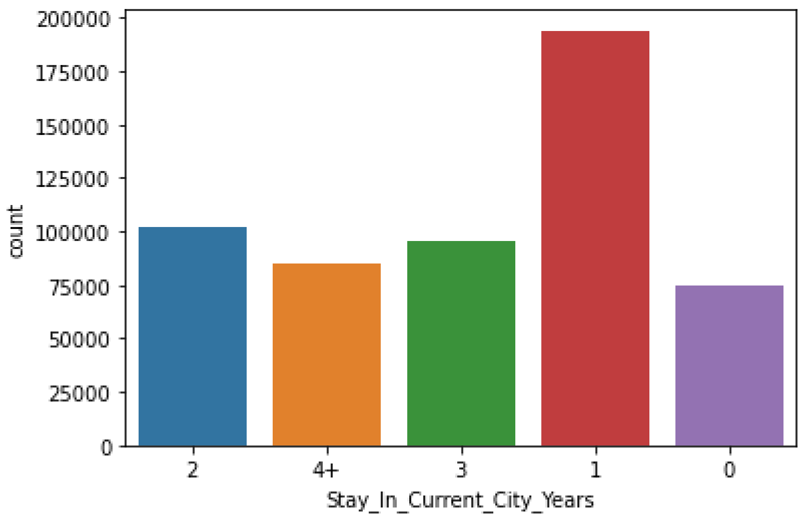
Observations:

1) No major difference in median purchase amount between male and female

In [150]:
```
df["Stay_In_Current_City_Years"].value_counts(normalize = True)
```

Out[150]:
```
1     0.352358
2     0.185137
3     0.173224
4+    0.154028
0     0.135252
Name: Stay_In_Current_City_Years, dtype: float64
```

In [12]:
```
sns.countplot(data = df, x ="Stay_In_Current_City_Years")
plt.show()
```



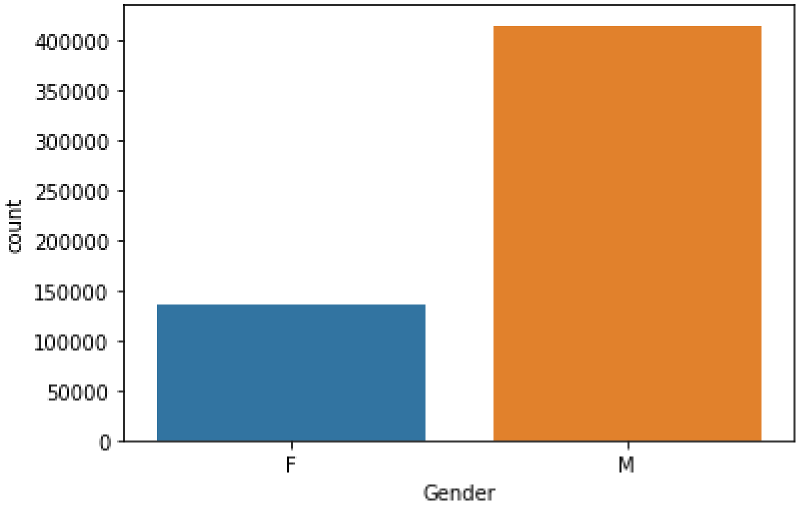
Observations:

1) 35% of customers are staying in their current cities from past 1 year.

In [24]:
```
df["Gender"].value_counts(normalize = True)*100
```

Out[24]:
```
M    75.310507
F    24.689493
Name: Gender, dtype: float64
```

In [13]:
```
sns.countplot(data = df, x = "Gender")
plt.show()
```



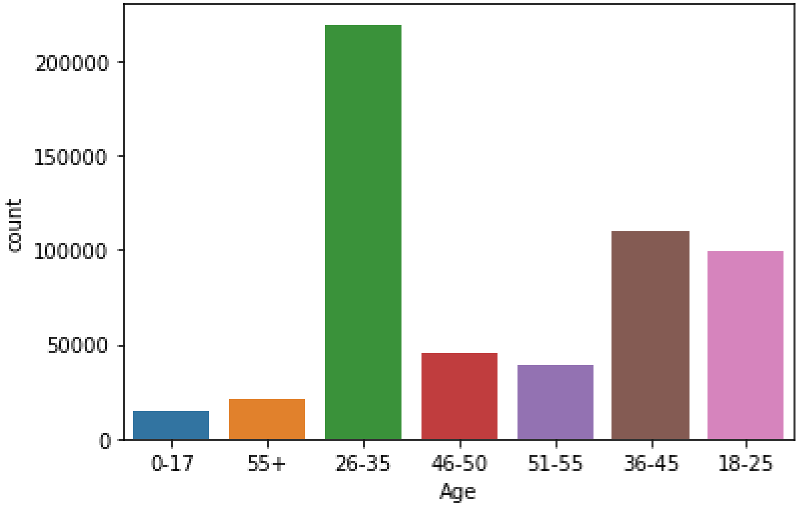
Observations:

1) male orders = 75%, Female orders = 25%

In [152]:
```
df["Age"].value_counts(normalize = True)*100
```

Out[152]:
```
26-35    39.919974
36-45    19.999891
18-25    18.117760
46-50     8.308246
51-55     6.999316
55+       3.909335
0-17      2.745479
Name: Age, dtype: float64
```

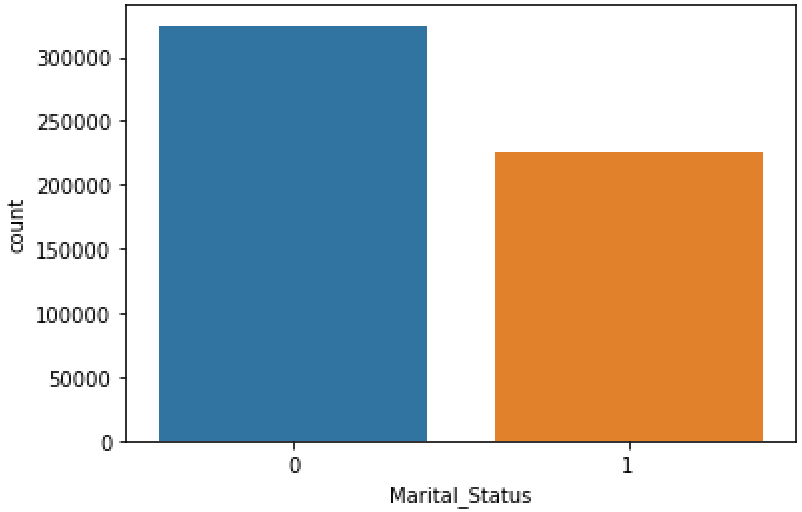
In [18]:
```
sns.countplot(data = df, x = "Age")
plt.show()
```



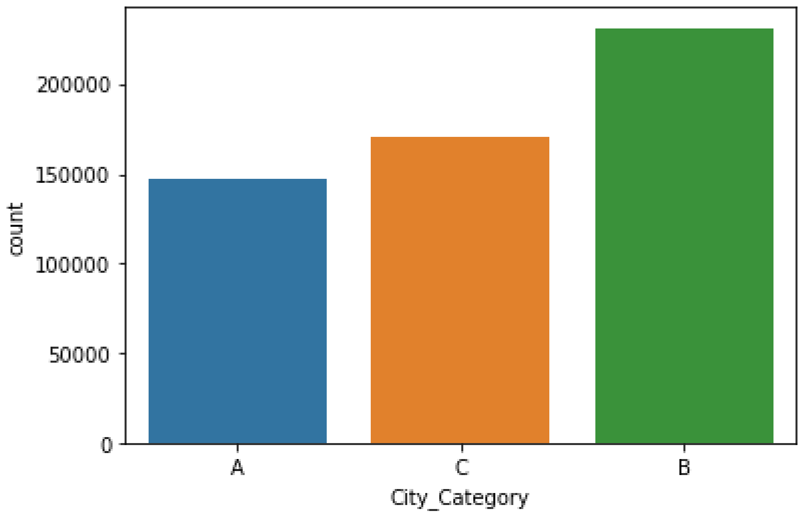
Observations:

1) 78% of the people who purchased on black friday are in the age group of 18-45

In [58]:
```
sns.countplot(data = df, x = "Marital_Status")
plt.show()
```



In [60]:
```
sns.countplot(data = df, x = "City_Category")
plt.show()
```



Customer purchase behavior against the customer's gender

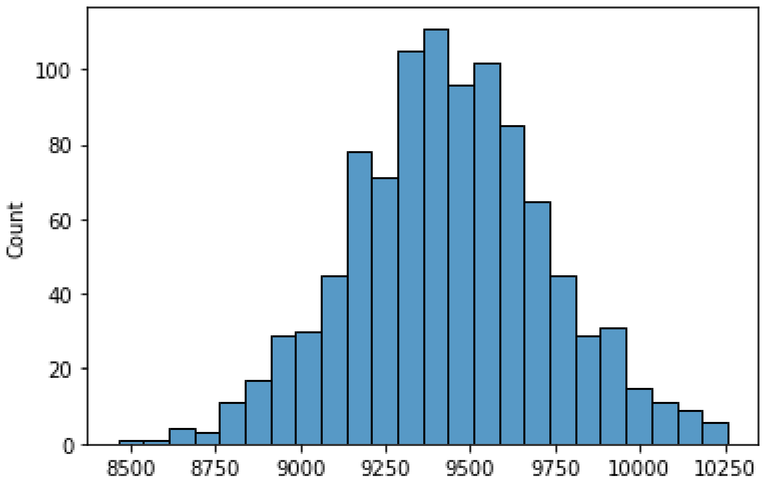
In [122]:
```
df.groupby(by = "Gender")["Purchase"].describe()
```

Out[122]:

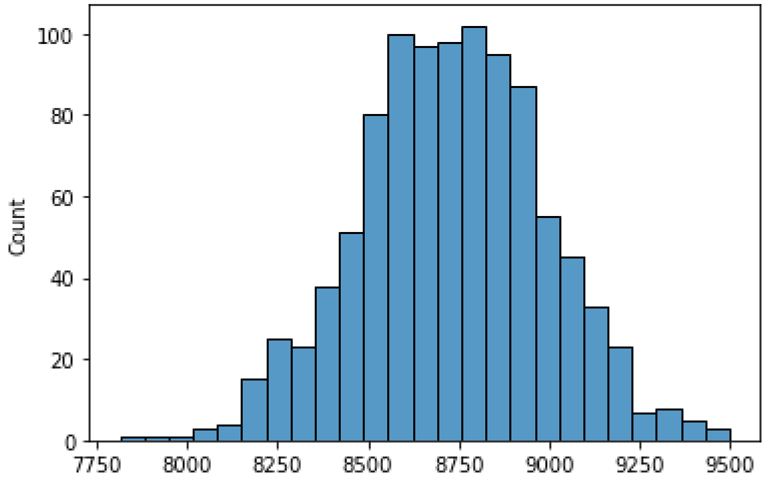
Gender	count	mean	std	min	25%	50%	75%	max
F	135809.0	8734.565765	4767.233289	12.0	5433.0	7914.0	11400.0	23959.0
M	414259.0	9437.526040	5092.186210	12.0	5863.0	8098.0	12454.0	23961.0

In [72]:
```
# Bootstraping
sample_size = 300
no_of_samples = 1000
male_sample_means = [df[df["Gender"]=="M"]["Purchase"].sample(sample_size, replace = True).mean() for i in range(no_of_
female_sample_means = [df[df["Gender"]=="F"]["Purchase"].sample(sample_size, replace = True).mean() for i in range(no_
```

In [73]:
```
sns.histplot(male_sample_means)
plt.show()
```



In [74]:
```
sns.histplot(female_sample_means)
plt.show()
```



In [79]:
```
mu_male = np.mean(male_sample_means)
std_male = np.std(male_sample_means)

mu_female = np.mean(female_sample_means)
std_female = np.std(female_sample_means)
```

In [80]:
```
# 95th Confidence Interval for male:
(mu_male - 1.95 *  std_male , mu_male + 1.95 *  std_male )
```

Out[80]:
```
(8865.375550957968, 10008.01566904203)
```

In [81]:
```
# 95th Confidence Interval for female:
(mu_female - 1.95 *  std_female , mu_female + 1.95 *  std_female )
```

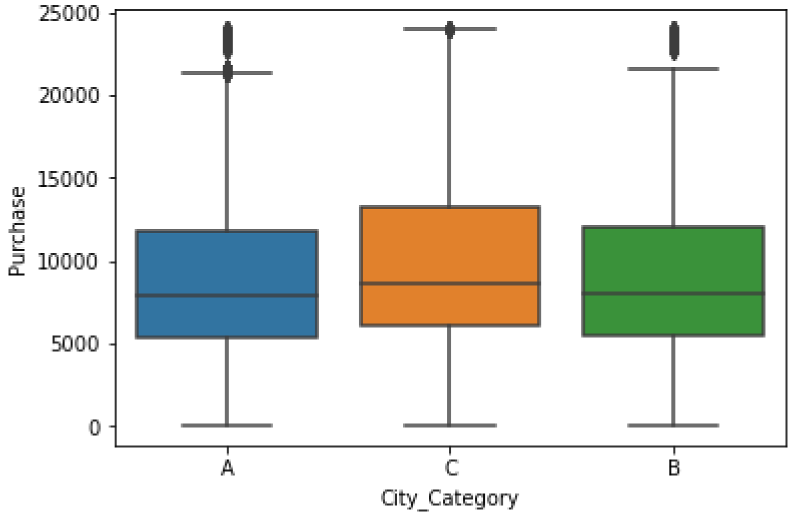
Out[81]:
```
(8228.568976106875, 9231.978963893122)
```

Observations:

1) 95th Confidence intervals for male and female are overlapping , so we can not make any conclusion about there purchase behavior.

Customer purchase behavior against the customer's City_Category

In [153]:
```
sns.boxplot(data = df, y = "Purchase", x = "City_Category")
plt.show()
```



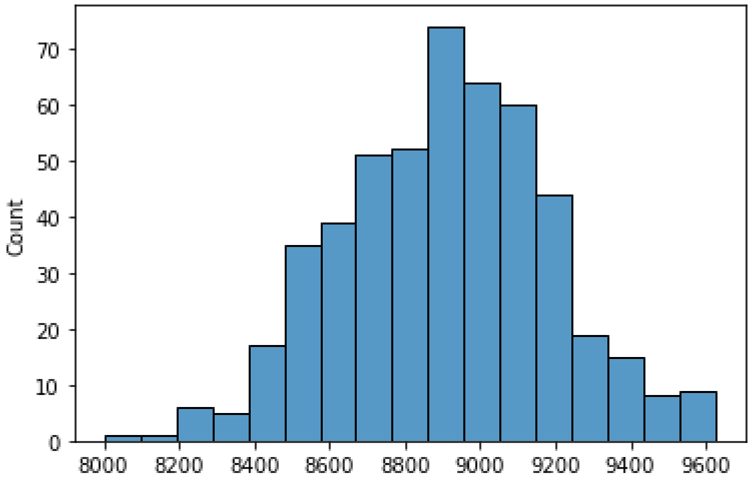
In [103]:
```
df.groupby(by = "City_Category")["Purchase"].describe()
```

Out[103]:

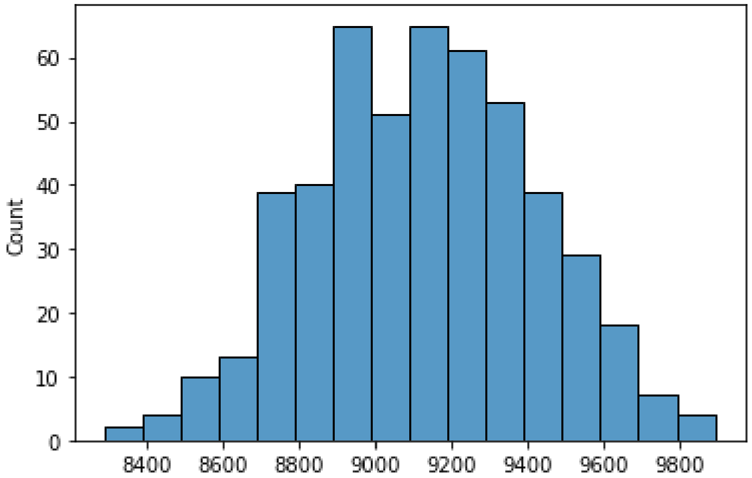
City_Category	count	mean	std	min	25%	50%	75%	max
A	147720.0	8911.939216	4892.115238	12.0	5403.0	7931.0	11786.0	23961.0
B	231173.0	9151.300563	4955.496566	12.0	5460.0	8005.0	11986.0	23960.0
C	171175.0	9719.920993	5189.465121	12.0	6031.5	8585.0	13197.0	23961.0

In [99]:
```
# Bootstraping
sample_size = 300
no_of_samples = 500
A_city_sample_means = [df[df["City_Category"]=="A"]["Purchase"].sample(sample_size, replace = True).mean() for i in ra
B_city_sample_means = [df[df["City_Category"]=="B"]["Purchase"].sample(sample_size, replace = True).mean() for i in ra
C_city_sample_means = [df[df["City_Category"]=="C"]["Purchase"].sample(sample_size, replace = True).mean() for i in ra
```

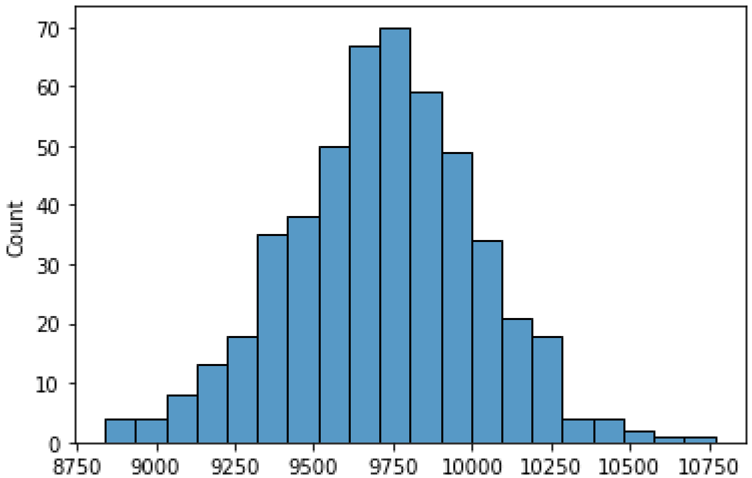
In [100]:
```
sns.histplot(A_city_sample_means)
plt.show()
```



In [101]:
```
sns.histplot(B_city_sample_means)
plt.show()
```



In [102]:
```
sns.histplot(C_city_sample_means)
plt.show()
```



In [111]:
```
mu_A = np.mean(A_city_sample_means)
std_A = np.std(A_city_sample_means)

mu_B = np.mean(B_city_sample_means)
std_B = np.std(B_city_sample_means)

mu_C = np.mean(C_city_sample_means)
std_C = np.std(C_city_sample_means)
```

In [112]:
```
# 95th Confidence Interval for city A:
(mu_A - 1.95 * std_A , mu_A + 1.95 * std_A )
```

Out[112]:
```
(8366.068802953821, 9450.059383712847)
```

In [113]:
```
# 95th Confidence Interval for city B:
(mu_B - 1.95 * std_B , mu_B + 1.95 * std_B )
```

Out[113]:
```
(8559.200679630176, 9703.05633370316)
```

In [114]:
```
# 95th Confidence Interval for city C:
(mu_C - 1.95 * std_C , mu_C + 1.95 * std_C )
```

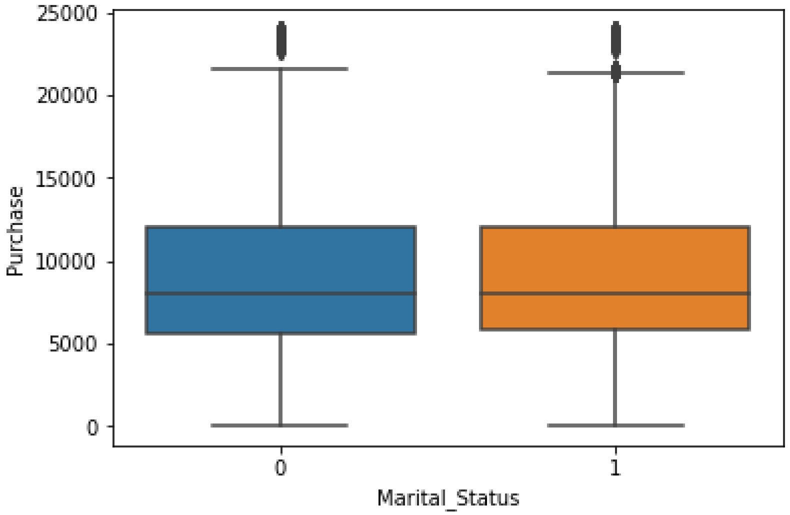
Out[114]:
```
(9124.586458266884, 10310.869155066448)
```

Observations:

1) 95th Confidence intervals for city category A, B, C are overlapping , so we can not make any conclusion about there purchase behavior.

Customer purchase behavior against the customer's Marital_Status:

In [154]:
```
sns.boxplot(data = df, y = "Purchase", x = "Marital_Status")
plt.show()
```



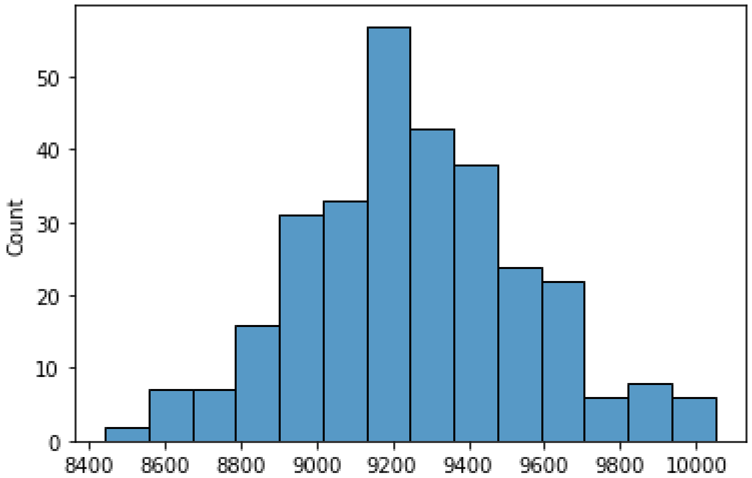
In [124]:
```
df.groupby(by = "Marital_Status")["Purchase"].describe()
```

Out[124]:

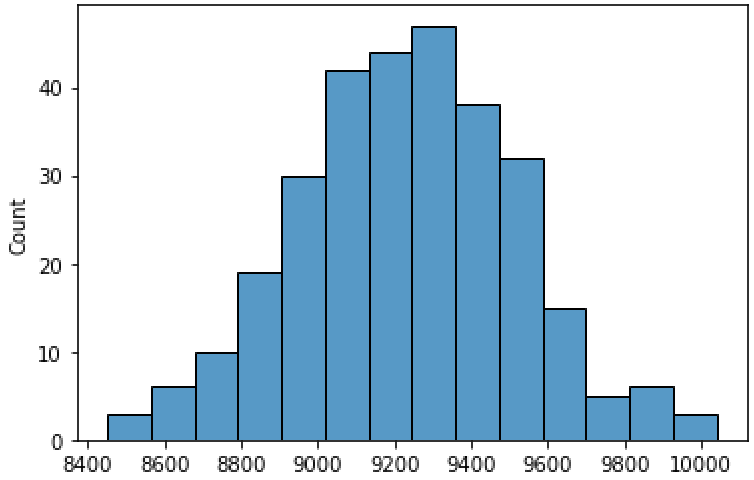
Marital_Status	count	mean	std	min	25%	50%	75%	max
0	324731.0	9265.907619	5027.347859	12.0	5605.0	8044.0	12061.0	23961.0
1	225337.0	9261.174574	5016.897378	12.0	5843.0	8051.0	12042.0	23961.0

In [125]:
```
# Bootstraping
sample_size = 300
no_of_samples = 300
ms0_sample_means = [df[df["Marital_Status"]==0]["Purchase"].sample(sample_size, replace = True).mean() for i in range(
ms1_sample_means = [df[df["Marital_Status"]==1]["Purchase"].sample(sample_size, replace = True).mean() for i in range(
```

In [126]:
```
sns.histplot(ms0_sample_means)
plt.show()
```



In [127]:
```
sns.histplot(ms1_sample_means)
plt.show()
```



In [128]:
```
mu_ms0 = np.mean(ms0_sample_means)
std_ms0 = np.std(ms0_sample_means)

mu_ms1 = np.mean(ms1_sample_means)
std_ms1 = np.std(ms1_sample_means)
```

In [131]:
```
# 95th Confidence Interval for Marital_Status 0:
(mu_ms0 - 1.95 * std_ms0 , mu_ms0 + 1.95 * std_ms0 )
```

Out[131]:
```
(8661.61063309677, 9846.760922458787)
```

In [130]:
```
# 95th Confidence Interval for Marital_Status 1:
(mu_ms1 - 1.95 * std_ms1 , mu_ms1 + 1.95 * std_ms1 )
```

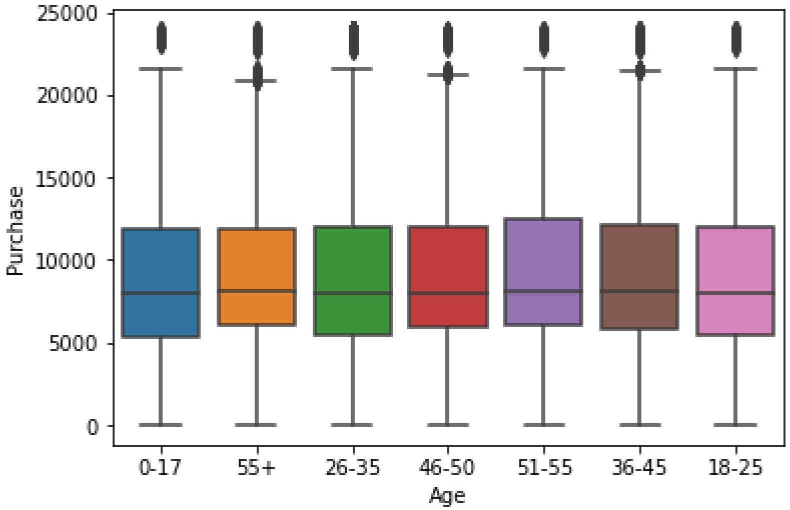
Out[130]:
```
(8671.620781027128, 9787.872063417317)
```

Observations:

1) 95th Confidence intervals for Marital status 0 and 1 are overlapping , so we can not make any conclusion about there purchase behavior.

Customer purchase behavior against the customer's Age:

In [155]:
```
sns.boxplot(data = df, y = "Purchase", x = "Age")
plt.show()
```



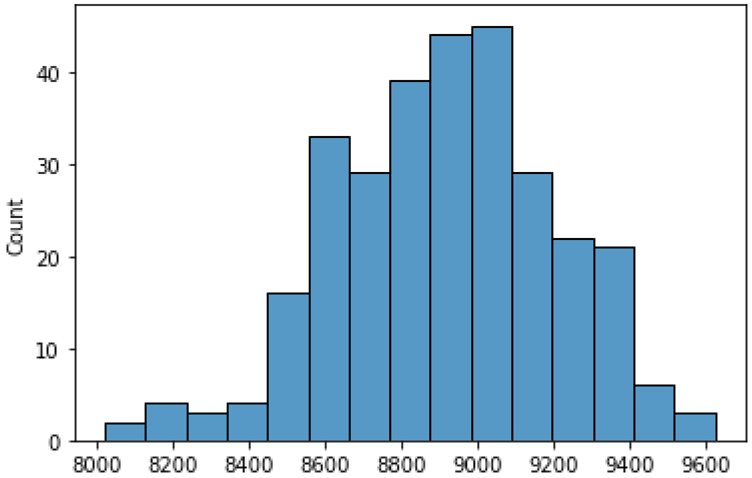
In [132]:
```
df.groupby(by = "Age")["Purchase"].describe()
```

Out[132]:

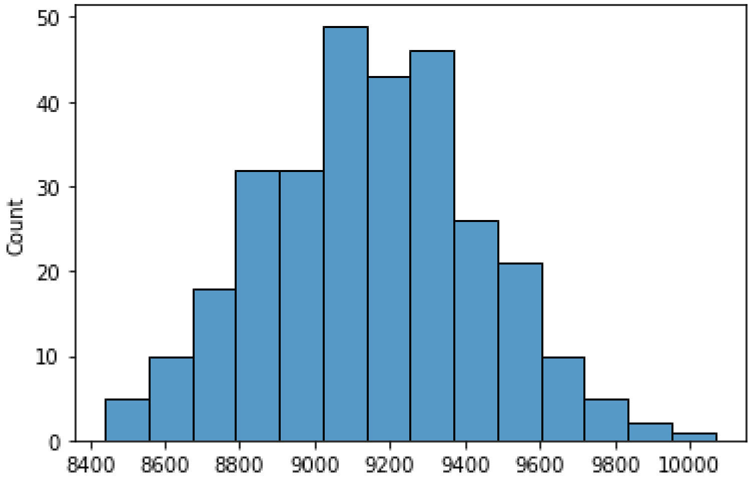
Age	count	mean	std	min	25%	50%	75%	max
0-17	15102.0	8933.464640	5111.114046	12.0	5328.0	7986.0	11874.0	23955.0
18-25	99660.0	9169.663606	5034.321997	12.0	5415.0	8027.0	12028.0	23958.0
26-35	219587.0	9252.690633	5010.527303	12.0	5475.0	8030.0	12047.0	23961.0
36-45	110013.0	9331.350695	5022.923879	12.0	5876.0	8061.0	12107.0	23960.0
46-50	45701.0	9208.625697	4967.216367	12.0	5888.0	8036.0	11997.0	23960.0
51-55	38501.0	9534.808031	5087.368080	12.0	6017.0	8130.0	12462.0	23960.0
55+	21504.0	9336.280459	5011.493996	12.0	6018.0	8105.5	11932.0	23960.0

In [134]:
```
# Bootstraping
sample_size = 300
no_of_samples = 300
age_0_17_sample_means = [df[df["Age"]=="0-17"]["Purchase"].sample(sample_size, replace = True).mean() for i in range(no
age_18_25_sample_means = [df[df["Age"]=="18-25"]["Purchase"].sample(sample_size, replace = True).mean() for i in range
age_26_35_sample_means = [df[df["Age"]=="26-35"]["Purchase"].sample(sample_size, replace = True).mean() for i in range
age_36_45_sample_means = [df[df["Age"]=="36-45"]["Purchase"].sample(sample_size, replace = True).mean() for i in range
age_46_50_sample_means = [df[df["Age"]=="46-50"]["Purchase"].sample(sample_size, replace = True).mean() for i in range
age_51_55_sample_means = [df[df["Age"]=="51-55"]["Purchase"].sample(sample_size, replace = True).mean() for i in range
age_55plus_sample_means = [df[df["Age"]=="55+"]["Purchase"].sample(sample_size, replace = True).mean() for i in range(
```

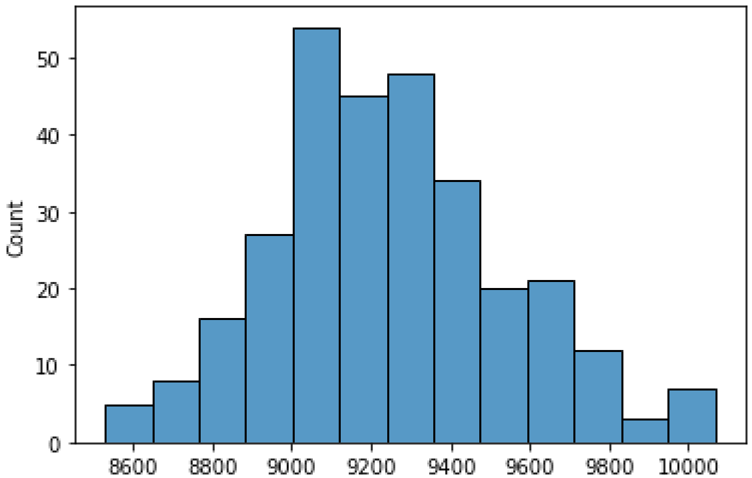
In [135]:
```
sns.histplot(age_0_17_sample_means)
plt.show()
```



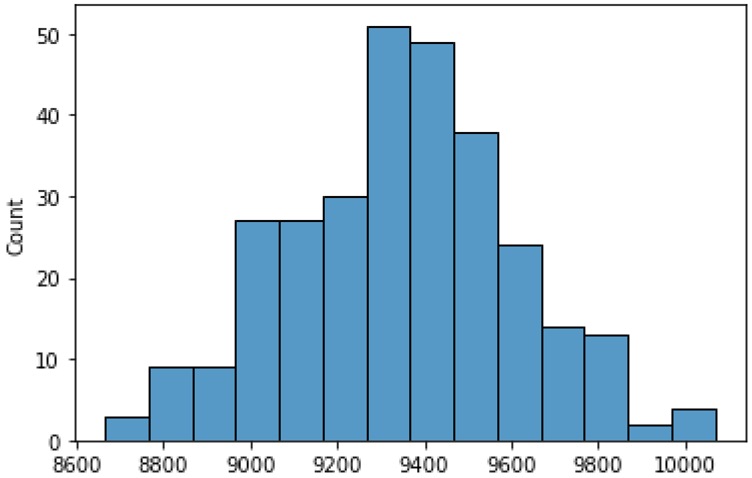
In [136]:
```
sns.histplot(age_18_25_sample_means)
plt.show()
```



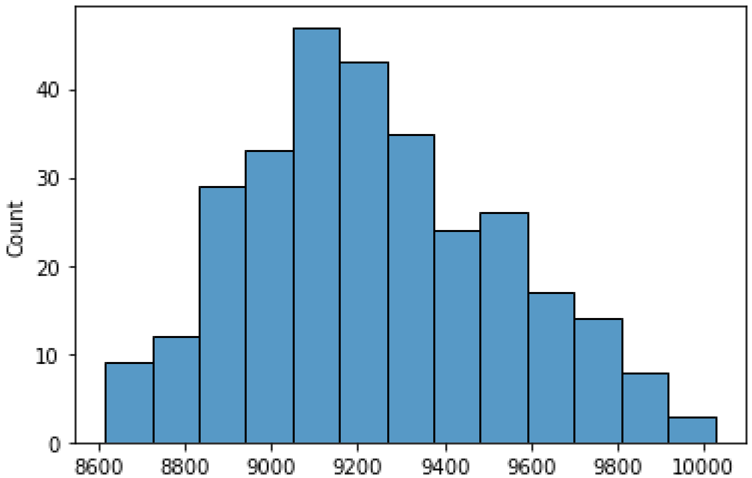
In [137]:
```
sns.histplot(age_26_35_sample_means)
plt.show()
```



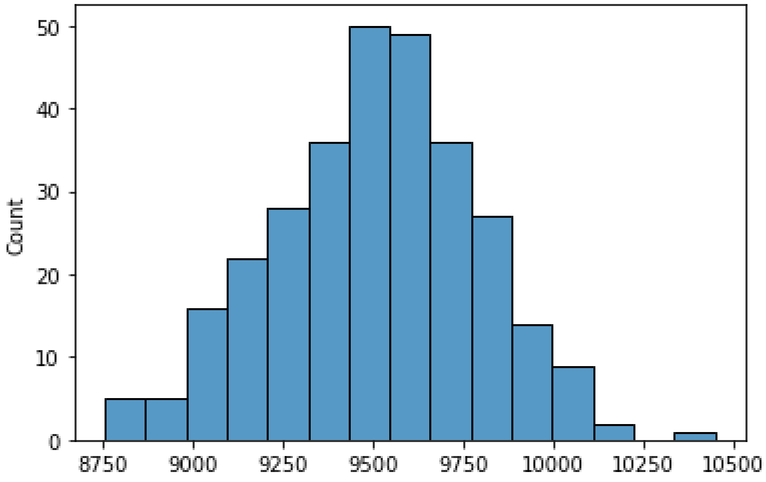
In [138]:
```
sns.histplot(age_36_45_sample_means)
plt.show()
```



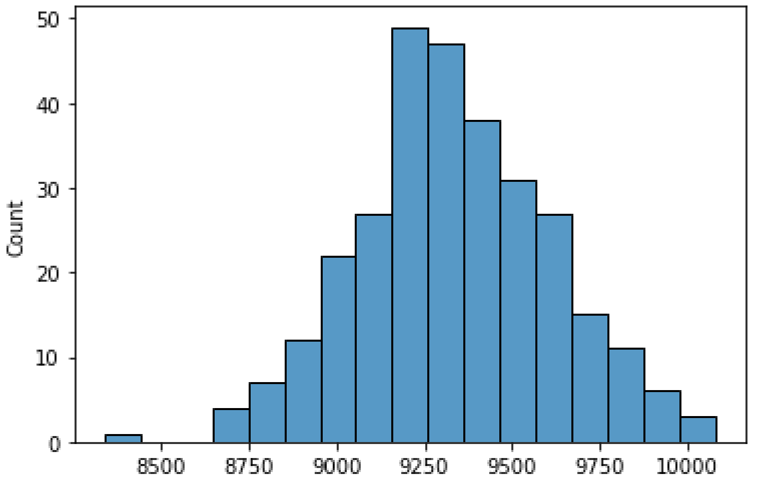
In [139]:
```
sns.histplot(age_46_50_sample_means)
plt.show()
```



In [140]:
```
sns.histplot(age_51_55_sample_means)
plt.show()
```



In [141]:
```
sns.histplot(age_55plus_sample_means)
plt.show()
```



In [142]:
```
mu_age_0_17 = np.mean(age_0_17_sample_means)
std_age_0_17 = np.std(age_0_17_sample_means)

mu_age_18_25 = np.mean(age_18_25_sample_means)
std_age_18_25 = np.std(age_18_25_sample_means)

mu_age_26_35 = np.mean(age_26_35_sample_means)
std_age_26_35 = np.std(age_26_35_sample_means)

mu_age_36_45 = np.mean(age_36_45_sample_means)
std_age_36_45 = np.std(age_36_45_sample_means)

mu_age_46_50 = np.mean(age_46_50_sample_means)
std_age_46_50 = np.std(age_46_50_sample_means)

mu_age_51_55 = np.mean(age_51_55_sample_means)
std_age_51_55 = np.std(age_51_55_sample_means)

mu_age_55plus = np.mean(age_55plus_sample_means)
std_age_55plus = np.std(age_55plus_sample_means)
```

In [143]:
```
# 95th Confidence Interval for Age group 0_17:
(mu_age_0_17 - 1.95 * std_age_0_17 , mu_age_0_17 + 1.95 * std_age_0_17 )
```

Out[143]:
```
(8361.492412792033, 9474.151764985747)
```

In [144]:
```
# 95th Confidence Interval for Age group 18_25:
(mu_age_18_25 - 1.95 * std_age_18_25 , mu_age_18_25 + 1.95 * std_age_18_25 )
```

Out[144]:
```
(8586.495267320517, 9714.502021568374)
```

In [145]:
```
# 95th Confidence Interval for Age group 26_35:
(mu_age_26_35 - 1.95 * std_age_26_35 , mu_age_26_35 + 1.95 * std_age_26_35)
```

Out[145]:
```
(8657.19866971871, 9835.391196947956)
```

In [146]:
```
# 95th Confidence Interval for Age group 36_45:
(mu_age_36_45 - 1.95 * std_age_36_45 , mu_age_36_45 + 1.95 * std_age_36_45 )
```
Out[146]:
```
(8833.393229981799, 9857.286836684865)
```

In [147]:
```
# 95th Confidence Interval for Age group 46_50:
(mu_age_46_50 - 1.95 * std_age_46_50 , mu_age_46_50 + 1.95 * std_age_46_50 )
```
Out[147]:
```
(8666.855996961807, 9814.014847482638)
```

In [148]:
```
# 95th Confidence Interval for Age group 51_55:
(mu_age_51_55 - 1.95 * std_age_51_55 , mu_age_51_55 + 1.95 * std_age_51_55 )
```
Out[148]:
```
(8954.971488029532, 10058.478045303804)
```

In [149]:
```
# 95th Confidence Interval for Age group 55+:
(mu_age_55plus - 1.95 * std_age_55plus , mu_age_55plus + 1.95 * std_age_55plus )
```
Out[149]:
```
(8791.727544981119, 9878.170566129995)
```

Observations:

1) 95th Confidence intervals for various Age groups are overlapping , so we can not make any conclusion about there purchase behavior.

Recommendations:

1) Product category 1, 5, 8 are popular than other product categories. Management should focus on other product categories to increase their sale.

2) Male orders are 75%, management should find ways to attract more females.

3) Focus on kids , they are very less in numbers.

In [ ]: