In [42]:
```
import pandas as pd
churn_data = pd.read_csv('churn.csv', index_col = 0)
```

In [43]:
```
# i) Count total number of duplicate records in the dataframe

duplicate_count = churn_data.duplicated().sum()
print("Total duplicate records:", duplicate_count)
```

```
Total duplicate records: 7
```

In [44]:
```
# ii) Count the no. of duplicate records in the churn dataframe based on the cutomerID column

cid_duplicates = churn_data['customerID'].duplicated().sum()
print("Duplicate records based on customerID:", cid_duplicates)
```

```
Duplicate records based on customerID: 7
```

In [45]:
```
# iii) Count number of missing values in each columns

print(churn_data.isnull().sum())
```

```
customerID           0
tenure               0
Contract             0
PaperlessBilling     0
PaymentMethod        0
MonthlyCharges      10
TotalCharges        15
gender               0
SeniorCitizen        5
Partner              0
Dependents           0
PhoneService         0
MultipleLines        0
InternetService      0
OnlineSecurity       0
OnlineBackup         0
DeviceProtection     0
TechSupport          0
StreamingTV          0
StreamingMovies      0
Churn                0
dtype: int64
```

In [46]:
```
# iv) Count the total no. of missing values for the variable TotalCharges

mv= churn_data['TotalCharges'].isnull().sum()
print("Missing values in TotalCharges:", mv)
```

```
Missing values in TotalCharges: 15
```

In [47]:

```
# v) Average monthly charge paid by a customer for the services he/she has signed up for

avg = churn_data["MonthlyCharges"].mean()
print("Average monthly charge:", avg)
```

```
Average monthly charge: 62.473481781376535
```

In [48]:

```
# vi) Display the records having “1@#” under the variable Dependents

print(churn_data[churn_data["Dependents"] == "1@#"])
```

```
     customerID tenure        Contract PaperlessBilling  \
90   1754-GKYPY     22  Month-to-month              Yes
126  9108-EQPNQ     10        Two year               No
175  2640-PMGFL     27  Month-to-month              Yes
221  8854-CCVSQ     18  Month-to-month              Yes
235  6876-ADESB    One  Month-to-month               No
239  1972-XMUWV     65        Two year              Yes

                PaymentMethod  MonthlyCharges  TotalCharges  gender  \
90   Bank transfer (automatic)           89.75       1938.90    Male
126    Credit card (automatic)           26.10        225.55  Female
175           Electronic check           79.50       2180.55    Male
221           Electronic check           80.65       1451.90    Male
235           Electronic check           48.95         48.95    Male
239    Credit card (automatic)           59.80       3808.20  Female

     SeniorCitizen Partner  ... PhoneService MultipleLines InternetService  \
90             1.0     Yes  ...          Yes            No     Fiber optic
126            0.0     Yes  ...          Yes           Yes              No
175            0.0      No  ...          Yes           Yes     Fiber optic
221            0.0      No  ...          Yes           Yes     Fiber optic
235            0.0      No  ...          Yes            No             DSL
239            0.0     Yes  ...          Yes            No             DSL

         OnlineSecurity         OnlineBackup     DeviceProtection  \
90                   No                   No                   No
126  No internet service  No internet service  No internet service
175                  No                   No                   No
221                  No                  Yes                   No
235                  No                   No                  Yes
239                  No                   No                   No

             TechSupport          StreamingTV      StreamingMovies Churn
90                   No                  Yes                  Yes    No
126  No internet service  No internet service  No internet service    No
175                 Yes                   No                   No   Yes
221                  No                   No                   No   Yes
235                  No                   No                   No   Yes
239                 Yes                  Yes                   No    No

[6 rows x 21 columns]
```

In [49]:

```
# vii) Replace null values in churn dataframe by median value or by max count class category

print(churn_data.isnull().any())
churn_data = churn_data.apply(lambda x:x.fillna(x.median()) if x.dtype=='float'
                              else x.fillna(x.value_counts().index[0]))
print("..............................................")
print(churn_data.isnull().any())
```

```
customerID          False
tenure              False
Contract            False
PaperlessBilling    False
PaymentMethod       False
MonthlyCharges       True
TotalCharges         True
gender              False
SeniorCitizen        True
Partner             False
Dependents          False
PhoneService        False
MultipleLines       False
InternetService     False
OnlineSecurity      False
OnlineBackup        False
DeviceProtection    False
TechSupport         False
StreamingTV         False
StreamingMovies     False
Churn               False
dtype: bool
.........................................
customerID          False
tenure              False
Contract            False
PaperlessBilling    False
PaymentMethod       False
MonthlyCharges      False
TotalCharges        False
gender              False
SeniorCitizen       False
Partner             False
Dependents          False
PhoneService        False
MultipleLines       False
InternetService     False
OnlineSecurity      False
OnlineBackup        False
DeviceProtection    False
TechSupport         False
```

```
StreamingTV          False
StreamingMovies      False
Churn                False
dtype: bool
```

In [50]:
```
churn_data.head(55)
```

Out[50]:

	customerID	tenure	Contract	PaperlessBilling	PaymentMethod	MonthlyCharges	TotalCharges	gender	SeniorCitizen	Partner	...	Pho
1	8260-NGFNY	One	Month-to-month	No	Mailed check	25.20	25.200	Female	0.0	No	...	
2	2359-QWQUL	39	One year	Yes	Credit card (automatic)	104.70	4134.850	Female	0.0	Yes	...	
3	6598/RFFVI	2	One year	No	Credit card (automatic)	19.30	28.300	Male	0.0	No	...	
4	IXSTS-8780	6	Month-to-month	Yes	Electronic check	90.10	521.300	Female	0.0	No	...	
5	2674/MIAHT	Four	Month-to-month	Yes	Mailed check	80.30	324.200	Female	0.0	No	...	
6	6077-BDPXA	3	Month-to-month	Yes	Electronic check	70.15	194.200	Female	0.0	No	...	
7	7929/SKFGK	70	Two year	No	Credit card (automatic)	114.30	8244.300	Male	0.0	Yes	...	

In [51]:
```
print(churn_data.dtypes)
```

```
customerID          object
tenure              object
Contract            object
PaperlessBilling    object
PaymentMethod       object
MonthlyCharges     float64
TotalCharges       float64
gender              object
SeniorCitizen      float64
Partner             object
Dependents          object
PhoneService        object
MultipleLines       object
InternetService     object
OnlineSecurity      object
OnlineBackup        object
DeviceProtection    object
TechSupport         object
StreamingTV         object
StreamingMovies     object
Churn               object
dtype: object
```