

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

Importing customer churn data set for analysis.

```
churn =
pd.read_csv(filepath_or_buffer='Customer_Churn_Data.csv',delimiter=',',
,encoding='latin-1')
churn.head(10)

{"columns":[{"name":"index","rawType":"int64","type":"integer"},
{"name":"customerID","rawType":"object","type":"string"},
{"name":"gender","rawType":"object","type":"string"},
{"name":"SeniorCitizen","rawType":"int64","type":"integer"},
{"name":"Partner","rawType":"object","type":"string"},
{"name":"Dependents","rawType":"object","type":"string"},
{"name":"tenure","rawType":"int64","type":"integer"},
{"name":"PhoneService","rawType":"object","type":"string"},
{"name":"MultipleLines","rawType":"object","type":"string"},
{"name":"InternetService","rawType":"object","type":"string"},
{"name":"OnlineSecurity","rawType":"object","type":"string"},
{"name":"OnlineBackup","rawType":"object","type":"string"},
{"name":"DeviceProtection","rawType":"object","type":"string"},
{"name":"TechSupport","rawType":"object","type":"string"},
{"name":"StreamingTV","rawType":"object","type":"string"},
{"name":"StreamingMovies","rawType":"object","type":"string"},
{"name":"Contract","rawType":"object","type":"string"},
{"name":"PaperlessBilling","rawType":"object","type":"string"},
{"name":"PaymentMethod","rawType":"object","type":"string"},
{"name":"MonthlyCharges","rawType":"float64","type":"float"},
{"name":"TotalCharges","rawType":"object","type":"string"},
{"name":"Churn","rawType":"object","type":"string"}],"conversionMethod":
"pd.DataFrame","ref":"ca21d6a0-3c7b-42e1-83b2-56c6efa0f02d","rows":
[["0","7590-VHVEG","Female","0","Yes","No","1","No","No phone
service","DSL","No","Yes","No","No","No","No","Month-to-
month","Yes","Electronic check","29.85","29.85","No"],["1","5575-
GNVDE","Male","0","No","No","34","Yes","No","DSL","Yes","No","Yes","No
","No","No","One year","No","Mailed check","56.95","1889.5","No"],
["2","3668-
QPYBK","Male","0","No","No","2","Yes","No","DSL","Yes","Yes","No","No"
,"No","No","Month-to-month","Yes","Mailed
check","53.85","108.15","Yes"],["3","7795-
CFOCW","Male","0","No","No","45","No","No phone
service","DSL","Yes","No","Yes","Yes","No","No","One year","No","Bank
transfer (automatic)","42.3","1840.75","No"],["4","9237-
HQITU","Female","0","No","No","2","Yes","No","Fiber
```

```

optic","No","No","No","No","No","No","Month-to-
month","Yes","Electronic check","70.7","151.65","Yes"],["5","9305-
CDSKC","Female","0","No","No","8","Yes","Yes","Fiber
optic","No","No","Yes","No","Yes","Yes","Month-to-
month","Yes","Electronic check","99.65","820.5","Yes"],["6","1452-
KIOVK","Male","0","No","Yes","22","Yes","Yes","Fiber
optic","No","Yes","No","No","Yes","No","Month-to-month","Yes","Credit
card (automatic)","89.1","1949.4","No"],["7","6713-
OKOMC","Female","0","No","No","10","No","No phone
service","DSL","Yes","No","No","No","No","No","Month-to-
month","No","Mailed check","29.75","301.9","No"],["8","7892-
POOKP","Female","0","Yes","No","28","Yes","Yes","Fiber
optic","No","No","Yes","Yes","Yes","Yes","Month-to-
month","Yes","Electronic check","104.8","3046.05","Yes"],["9","6388-
TABGU","Male","0","No","Yes","62","Yes","No","DSL","Yes","Yes","No","N
o","No","No","One year","No","Bank transfer
(automatic)","56.15","3487.95","No"]], "shape":
{"columns":21,"rows":10}}

```

```
churn.shape
```

```
(7043, 21)
```

```
churn.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 7043 entries, 0 to 7042
```

```
Data columns (total 21 columns):
```

#	Column	Non-Null	Count	Dtype
0	customerID	7043	non-null	object
1	gender	7043	non-null	object
2	SeniorCitizen	7043	non-null	int64
3	Partner	7043	non-null	object
4	Dependents	7043	non-null	object
5	tenure	7043	non-null	int64
6	PhoneService	7043	non-null	object
7	MultipleLines	7043	non-null	object
8	InternetService	7043	non-null	object
9	OnlineSecurity	7043	non-null	object
10	OnlineBackup	7043	non-null	object
11	DeviceProtection	7043	non-null	object
12	TechSupport	7043	non-null	object
13	StreamingTV	7043	non-null	object
14	StreamingMovies	7043	non-null	object
15	Contract	7043	non-null	object
16	PaperlessBilling	7043	non-null	object
17	PaymentMethod	7043	non-null	object
18	MonthlyCharges	7043	non-null	float64
19	TotalCharges	7043	non-null	object

```
20 Churn          7043 non-null object
dtypes: float64(1), int64(2), object(18)
memory usage: 1.1+ MB
```

```
churn.isnull().sum()
```

customerID	0
gender	0
SeniorCitizen	0
Partner	0
Dependents	0
tenure	0
PhoneService	0
MultipleLines	0
InternetService	0
OnlineSecurity	0
OnlineBackup	0
DeviceProtection	0
TechSupport	0
StreamingTV	0
StreamingMovies	0
Contract	0
PaperlessBilling	0
PaymentMethod	0
MonthlyCharges	0
TotalCharges	0
Churn	0

```
dtype: int64
```

Checking for blank cells with no values.

```
churn.loc[churn['TotalCharges'] == ' ']
```

```
{
  "columns": [
    {"name": "index", "rawType": "int64", "type": "integer"},
    {"name": "customerID", "rawType": "object", "type": "string"},
    {"name": "gender", "rawType": "object", "type": "string"},
    {"name": "SeniorCitizen", "rawType": "int64", "type": "integer"},
    {"name": "Partner", "rawType": "object", "type": "string"},
    {"name": "Dependents", "rawType": "object", "type": "string"},
    {"name": "tenure", "rawType": "int64", "type": "integer"},
    {"name": "PhoneService", "rawType": "object", "type": "string"},
    {"name": "MultipleLines", "rawType": "object", "type": "string"},
    {"name": "InternetService", "rawType": "object", "type": "string"},
    {"name": "OnlineSecurity", "rawType": "object", "type": "string"},
    {"name": "OnlineBackup", "rawType": "object", "type": "string"},
    {"name": "DeviceProtection", "rawType": "object", "type": "string"},
    {"name": "TechSupport", "rawType": "object", "type": "string"},
    {"name": "StreamingTV", "rawType": "object", "type": "string"},
    {"name": "StreamingMovies", "rawType": "object", "type": "string"},
    {"name": "Contract", "rawType": "object", "type": "string"},
    {"name": "PaperlessBilling", "rawType": "object", "type": "string"},
    {"name": "PaymentMethod", "rawType": "object", "type": "string"},
    {"name": "MonthlyCharges", "rawType": "float64", "type": "float"},
    {"name": "TotalCharges", "rawType": "float64", "type": "float"},
    {"name": "Churn", "rawType": "object", "type": "string"}
  ]
}
```

```

{"name": "PaperlessBilling", "rawType": "object", "type": "string"},
{"name": "PaymentMethod", "rawType": "object", "type": "string"},
{"name": "MonthlyCharges", "rawType": "float64", "type": "float"},
{"name": "TotalCharges", "rawType": "object", "type": "string"},
{"name": "Churn", "rawType": "object", "type": "string"}], "conversionMethod":
"pd.DataFrame", "ref": "4f98605b-6513-46ce-91b5-606bed2da87e", "rows":
[["488", "4472-LVYGI", "Female", "0", "Yes", "Yes", "0", "No", "No phone
service", "DSL", "Yes", "No", "Yes", "Yes", "Yes", "No", "Two
year", "Yes", "Bank transfer (automatic)", "52.55", " ", "No"],
["753", "3115-CZMZD", "Male", "0", "No", "Yes", "0", "Yes", "No", "No", "No
internet service", "No internet service", "No internet service", "No
internet service", "No internet service", "No internet service", "Two
year", "No", "Mailed check", "20.25", " ", "No"], ["936", "5709-
LV0EQ", "Female", "0", "Yes", "Yes", "0", "Yes", "No", "DSL", "Yes", "Yes", "Yes"
, "No", "Yes", "Yes", "Two year", "No", "Mailed check", "80.85", " ", "No"],
["1082", "4367-NUYA0", "Male", "0", "Yes", "Yes", "0", "Yes", "Yes", "No", "No
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internet service", "No internet service", "No internet service", "Two
year", "No", "Mailed check", "25.75", " ", "No"], ["1340", "1371-
DWPAZ", "Female", "0", "Yes", "Yes", "0", "No", "No phone
service", "DSL", "Yes", "Yes", "Yes", "Yes", "Yes", "No", "Two
year", "No", "Credit card (automatic)", "56.05", " ", "No"], ["3331", "7644-
OMVMY", "Male", "0", "Yes", "Yes", "0", "Yes", "No", "No", "No internet
service", "No internet service", "No internet service", "No internet
service", "No internet service", "No internet service", "Two
year", "No", "Mailed check", "19.85", " ", "No"], ["3826", "3213-
VVOLG", "Male", "0", "Yes", "Yes", "0", "Yes", "Yes", "No", "No internet
service", "No internet service", "No internet service", "No internet
service", "No internet service", "No internet service", "Two
year", "No", "Mailed check", "25.35", " ", "No"], ["4380", "2520-
SGTTA", "Female", "0", "Yes", "Yes", "0", "Yes", "No", "No", "No internet
service", "No internet service", "No internet service", "No internet
service", "No internet service", "No internet service", "Two
year", "No", "Mailed check", "20.0", " ", "No"], ["5218", "2923-
ARZLG", "Male", "0", "Yes", "Yes", "0", "Yes", "No", "No", "No internet
service", "No internet service", "No internet service", "No internet
service", "No internet service", "No internet service", "One
year", "Yes", "Mailed check", "19.7", " ", "No"], ["6670", "4075-
WKNIU", "Female", "0", "Yes", "Yes", "0", "Yes", "Yes", "DSL", "No", "Yes", "Yes"
, "Yes", "Yes", "No", "Two year", "No", "Mailed check", "73.35", " ", "No"],
["6754", "2775-
SEFEE", "Male", "0", "No", "Yes", "0", "Yes", "Yes", "DSL", "Yes", "Yes", "No", "Y
es", "No", "No", "Two year", "Yes", "Bank transfer (automatic)", "61.9", "
", "No"]], "shape": {"columns": 21, "rows": 11}}

```

Replacing blank values in 'TotalCharges' with 0 as 'tanure' is 0 and than converting to float data type.

```
churn['TotalCharges'] = churn['TotalCharges'].replace(to_replace='
',value='0')
```

```
churn['TotalCharges'] = churn['TotalCharges'].astype(float)
```

```
churn.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 7043 entries, 0 to 7042
```

```
Data columns (total 21 columns):
```

#	Column	Non-Null	Count	Dtype
0	customerID	7043	non-null	object
1	gender	7043	non-null	object
2	SeniorCitizen	7043	non-null	int64
3	Partner	7043	non-null	object
4	Dependents	7043	non-null	object
5	tenure	7043	non-null	int64
6	PhoneService	7043	non-null	object
7	MultipleLines	7043	non-null	object
8	InternetService	7043	non-null	object
9	OnlineSecurity	7043	non-null	object
10	OnlineBackup	7043	non-null	object
11	DeviceProtection	7043	non-null	object
12	TechSupport	7043	non-null	object
13	StreamingTV	7043	non-null	object
14	StreamingMovies	7043	non-null	object
15	Contract	7043	non-null	object
16	PaperlessBilling	7043	non-null	object
17	PaymentMethod	7043	non-null	object
18	MonthlyCharges	7043	non-null	float64
19	TotalCharges	7043	non-null	float64
20	Churn	7043	non-null	object

```
dtypes: float64(2), int64(2), object(17)
```

```
memory usage: 1.1+ MB
```

```
churn.describe()
```

```
{"columns":[{"name":"index","rawType":"object","type":"string"},
{"name":"SeniorCitizen","rawType":"float64","type":"float"},
{"name":"tenure","rawType":"float64","type":"float"},
{"name":"MonthlyCharges","rawType":"float64","type":"float"},
{"name":"TotalCharges","rawType":"float64","type":"float"}],"conversionMethod":"pd.DataFrame","ref":"be89b78a-c810-4303-8ab2-f07b472dd110","rows":[["count","7043.0","7043.0","7043.0","7043.0"],
["mean","0.1621468124378816","32.37114865824223","64.76169246059918","2279.7343035638223"],
["std","0.3686116056100131","24.55948102309446","30.090047097678493","2266.7944696890213"],["min","0.0","0.0","18.25","0.0"],
["25%","0.0","9.0","35.5","398.55"]]
```

```
[ "50%", "0.0", "29.0", "70.35", "1394.55"],
[ "75%", "0.0", "55.0", "89.85", "3786.6"],
[ "max", "1.0", "72.0", "118.75", "8684.8"]], "shape":
{"columns":4,"rows":8}}
```

```
churn.describe(include='all')
```

```
{ "columns": [{"name": "index", "rawType": "object", "type": "string"},
{"name": "customerID", "rawType": "object", "type": "unknown"},
{"name": "gender", "rawType": "object", "type": "unknown"},
{"name": "SeniorCitizen", "rawType": "float64", "type": "float"},
{"name": "Partner", "rawType": "object", "type": "unknown"},
{"name": "Dependents", "rawType": "object", "type": "unknown"},
{"name": "tenure", "rawType": "float64", "type": "float"},
{"name": "PhoneService", "rawType": "object", "type": "unknown"},
{"name": "MultipleLines", "rawType": "object", "type": "unknown"},
{"name": "InternetService", "rawType": "object", "type": "unknown"},
{"name": "OnlineSecurity", "rawType": "object", "type": "unknown"},
{"name": "OnlineBackup", "rawType": "object", "type": "unknown"},
{"name": "DeviceProtection", "rawType": "object", "type": "unknown"},
{"name": "TechSupport", "rawType": "object", "type": "unknown"},
{"name": "StreamingTV", "rawType": "object", "type": "unknown"},
{"name": "StreamingMovies", "rawType": "object", "type": "unknown"},
{"name": "Contract", "rawType": "object", "type": "unknown"},
{"name": "PaperlessBilling", "rawType": "object", "type": "unknown"},
{"name": "PaymentMethod", "rawType": "object", "type": "unknown"},
{"name": "MonthlyCharges", "rawType": "float64", "type": "float"},
{"name": "TotalCharges", "rawType": "float64", "type": "float"},
{"name": "Churn", "rawType": "object", "type": "unknown"}], "conversionMethod": "pd.DataFrame", "ref": "fcf4e920-dc02-4c72-94a6-08c8ba54e1fc", "rows":
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"7043.0", "7043.0", "7043"],
[ "unique", "7043", "2", null, "2", "2", null, "2", "3", "3", "3", "3", "3", "3", "3",
"3", "3", "2", "4", null, null, "2"], [ "top", "3186-
AJIEK", "Male", null, "No", "No", null, "Yes", "No", "Fiber
optic", "No", "No", "No", "No", "No", "No", "Month-to-
month", "Yes", "Electronic check", null, null, "No"],
[ "freq", "1", "3555", null, "3641", "4933", null, "6361", "3390", "3096", "3498",
"3088", "3095", "3473", "2810", "2785", "3875", "4171", "2365", null, null, "51
74"],
[ "mean", null, null, "0.1621468124378816", null, null, "32.37114865824223", n
ull, null, null, null, null, null, null, null, null, null, null, null, "64.7616924
6059918", "2279.7343035638223", null],
[ "std", null, null, "0.3686116056100131", null, null, "24.55948102309446", nu
ll, null, null, null, null, null, null, null, null, null, null, null, "30.09004709
7678493", "2266.7944696890213", null],
[ "min", null, null, "0.0", null, null, "0.0", null, null, null, null, null, null, n
ull, null, null, null, null, null, "18.25", "0.0", null],
[ "25%", null, null, "0.0", null, null, "9.0", null, null, null, null, null, null, n
```

```

ull,null,null,null,null,null,"35.5","398.55",null],
["50%",null,null,"0.0",null,null,"29.0",null,null,null,null,null,
null,null,null,null,null,null,"70.35","1394.55",null],
["75%",null,null,"0.0",null,null,"55.0",null,null,null,null,null,
null,null,null,null,null,null,"89.85","3786.6",null],
["max",null,null,"1.0",null,null,"72.0",null,null,null,null,null,
null,null,null,null,null,null,"118.75","8684.8",null]], "shape":
{"columns":21,"rows":11}}

```

Checking for duplicate values.

```
print(churn.duplicated().sum())
```

```
0
```

Checking duplicate values in CustomerID column wheather values inside that column in duplicate or unique.

```
print(churn['customerID'].duplicated().sum())
```

```
0
```

Converting 'SeniorCitizen' column values from numerical to categorical.

```

def convert(value):
    if value == 1:
        return 'Yes'
    else:
        return 'No'

```

```

churn['SeniorCitizen'] = churn['SeniorCitizen'].apply(convert)
churn.head(10)

```

```

{"columns":[{"name":"index","rawType":"int64","type":"integer"},
{"name":"customerID","rawType":"object","type":"string"},
{"name":"gender","rawType":"object","type":"string"},
{"name":"SeniorCitizen","rawType":"object","type":"string"},
{"name":"Partner","rawType":"object","type":"string"},
{"name":"Dependents","rawType":"object","type":"string"},
{"name":"tenure","rawType":"int64","type":"integer"},
{"name":"PhoneService","rawType":"object","type":"string"},
{"name":"MultipleLines","rawType":"object","type":"string"},
{"name":"InternetService","rawType":"object","type":"string"},
{"name":"OnlineSecurity","rawType":"object","type":"string"},
{"name":"OnlineBackup","rawType":"object","type":"string"},
{"name":"DeviceProtection","rawType":"object","type":"string"},
{"name":"TechSupport","rawType":"object","type":"string"},
{"name":"StreamingTV","rawType":"object","type":"string"},
{"name":"StreamingMovies","rawType":"object","type":"string"},

```



```
{
  "name": "Contract", "rawType": "object", "type": "string",
  "name": "PaperlessBilling", "rawType": "object", "type": "string",
  "name": "PaymentMethod", "rawType": "object", "type": "string",
  "name": "MonthlyCharges", "rawType": "float64", "type": "float",
  "name": "TotalCharges", "rawType": "float64", "type": "float",
  "name": "Churn", "rawType": "object", "type": "string"
}], "conversionMethod": "pd.DataFrame", "ref": "6a0c0e1b-3ca0-4c28-a6a0-de9597bcfe9a", "rows": [
  ["0", "7590-VHVEG", "Female", "No", "Yes", "No", "1", "No", "No phone service", "DSL", "No", "Yes", "No", "No", "No", "No", "Month-to-month", "Yes", "Electronic check", "29.85", "29.85", "No"],
  ["1", "5575-GNVDE", "Male", "No", "No", "No", "34", "Yes", "No", "DSL", "Yes", "No", "Yes", "No", "No", "No", "One year", "No", "Mailed check", "56.95", "1889.5", "No"],
  ["2", "3668-QPYBK", "Male", "No", "No", "No", "2", "Yes", "No", "DSL", "Yes", "Yes", "No", "No", "No", "No", "Month-to-month", "Yes", "Mailed check", "53.85", "108.15", "Yes"],
  ["3", "7795-CFOCW", "Male", "No", "No", "No", "45", "No", "No phone service", "DSL", "Yes", "No", "Yes", "Yes", "No", "No", "One year", "No", "Bank transfer (automatic)", "42.3", "1840.75", "No"],
  ["4", "9237-HQITU", "Female", "No", "No", "No", "2", "Yes", "No", "Fiber optic", "No", "No", "No", "No", "No", "No", "Month-to-month", "Yes", "Electronic check", "70.7", "151.65", "Yes"],
  ["5", "9305-CDSKC", "Female", "No", "No", "No", "8", "Yes", "Yes", "Fiber optic", "No", "No", "Yes", "No", "Yes", "Yes", "Month-to-month", "Yes", "Electronic check", "99.65", "820.5", "Yes"],
  ["6", "1452-KIOVK", "Male", "No", "No", "Yes", "22", "Yes", "Yes", "Fiber optic", "No", "Yes", "No", "No", "Yes", "No", "Month-to-month", "Yes", "Credit card (automatic)", "89.1", "1949.4", "No"],
  ["7", "6713-OKOMC", "Female", "No", "No", "No", "10", "No", "No phone service", "DSL", "Yes", "No", "No", "No", "No", "No", "Month-to-month", "No", "Mailed check", "29.75", "301.9", "No"],
  ["8", "7892-P00KP", "Female", "No", "Yes", "No", "28", "Yes", "Yes", "Fiber optic", "No", "No", "Yes", "Yes", "Yes", "Yes", "Month-to-month", "Yes", "Electronic check", "104.8", "3046.05", "Yes"],
  ["9", "6388-TABGU", "Male", "No", "No", "Yes", "62", "Yes", "No", "DSL", "Yes", "Yes", "No", "No", "No", "No", "One year", "No", "Bank transfer (automatic)", "56.15", "3487.95", "No"]
]], "shape": {"columns": 21, "rows": 10}}
```

Exploratory Data Analysis

How many Customers are churned out from our company?

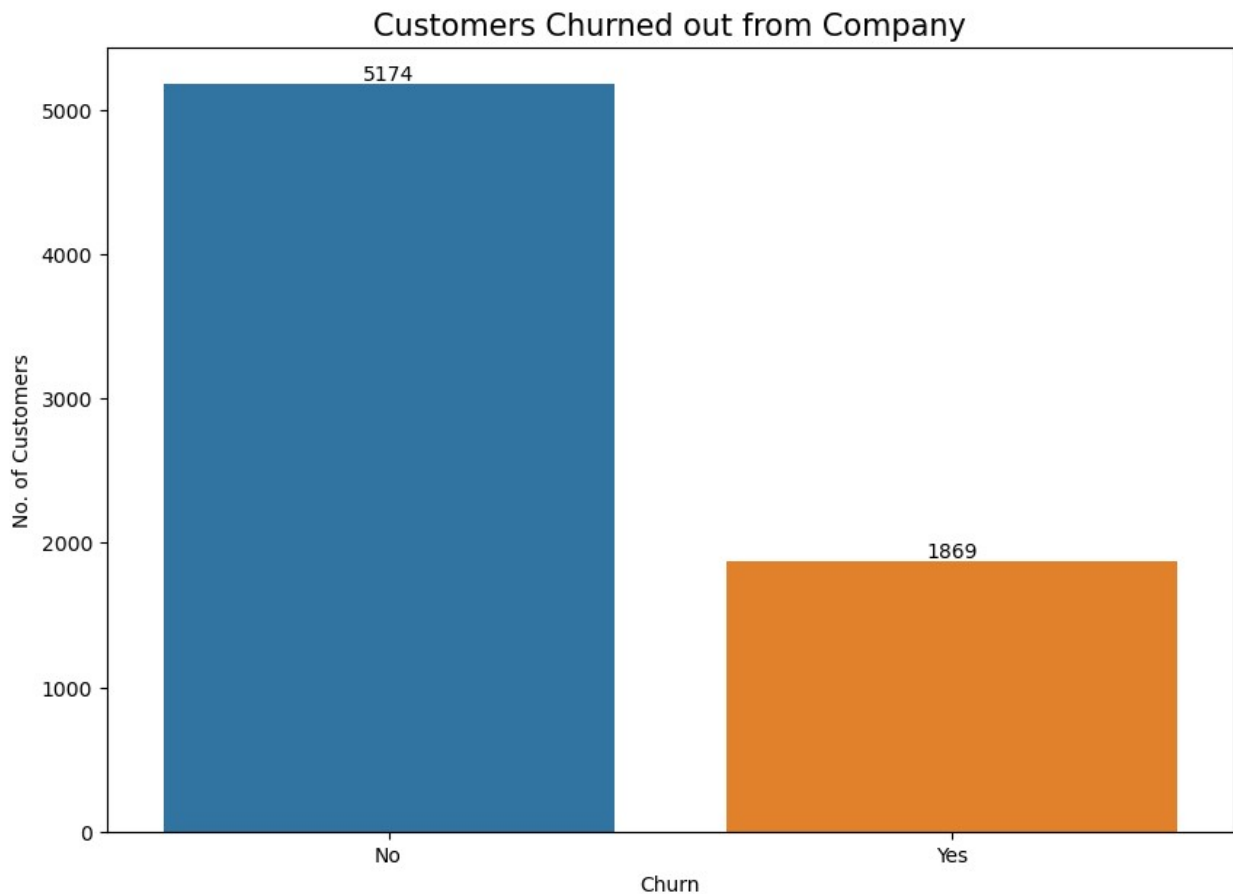
```
plt.figure(figsize=(10,7))

cco = sns.countplot(data=churn, x='Churn', hue= 'Churn')
plt.ylabel('No. of Customers')
plt.title('Customers Churned out from Company',fontsize = 15)

for bars in cco.containers:
```



```
cco.bar_label(bars)
plt.show()
```



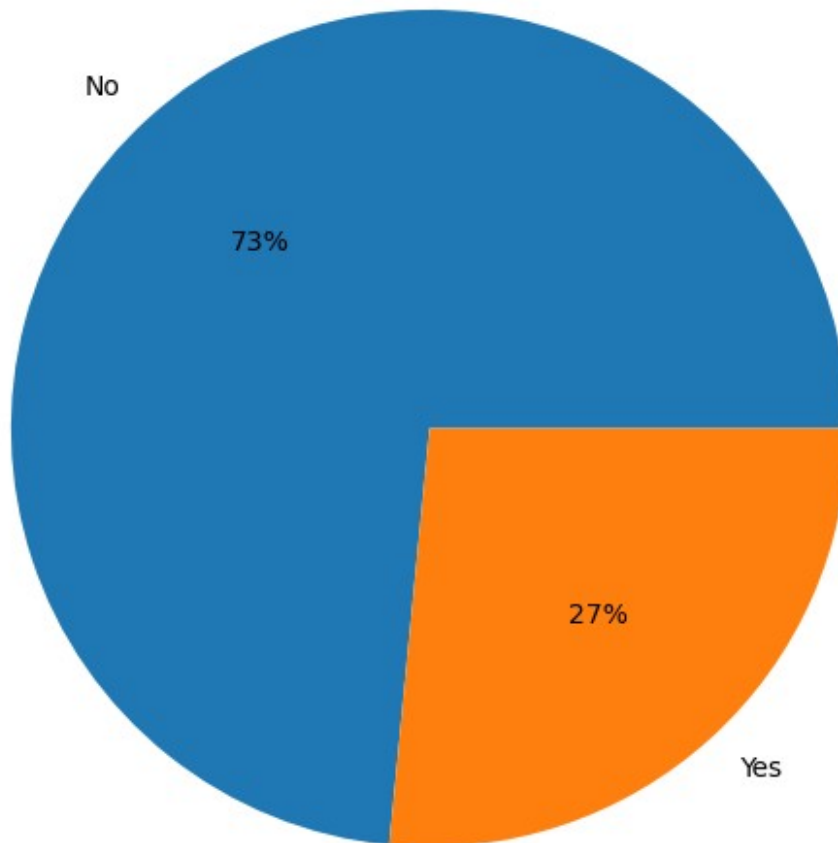
```
group_churn = churn.groupby('Churn',as_index=False)
churn_count = group_churn['customerID'].count()
churn_count

{"columns":[{"name":"index","rawType":"int64","type":"integer"},
{"name":"Churn","rawType":"object","type":"string"},
{"name":"customerID","rawType":"int64","type":"integer"}],"conversionMethod":"pd.DataFrame","ref":"f657b35f-2601-40ae-8bf6-7c98a26a608f","rows":[["0","No","5174"],["1","Yes","1869"]],"shape":{"columns":2,"rows":2}}

plt.figure(figsize=(7,7))

plt.pie(data=churn_count,x='customerID',labels='Churn',autopct='%1.0f%%')
plt.title('Percentage of Churned Customers', fontsize = 15)
plt.show()
```

Percentage of Churned Customers



in the above graph we can see that there are 27% of customers who churned out from the company. And now explore the reason behind it.

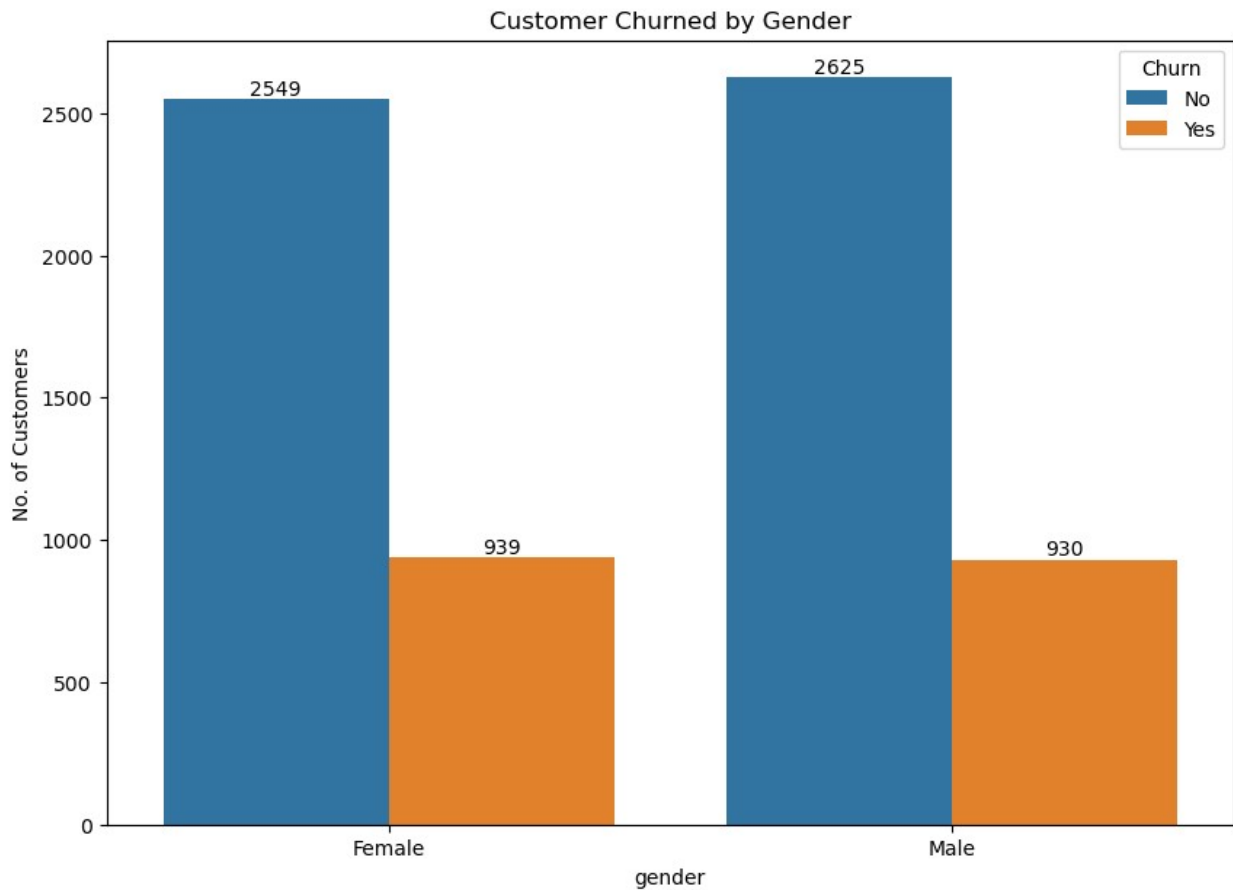
Customer churned out based on gender?

```
plt.figure(figsize=(10,7))

ccg = sns.countplot(data=churn, x='gender', hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Customer Churned by Gender')

for bars in ccg.containers:
    ccg.bar_label(bars)

plt.show()
```



There is no impact of gender for churn.

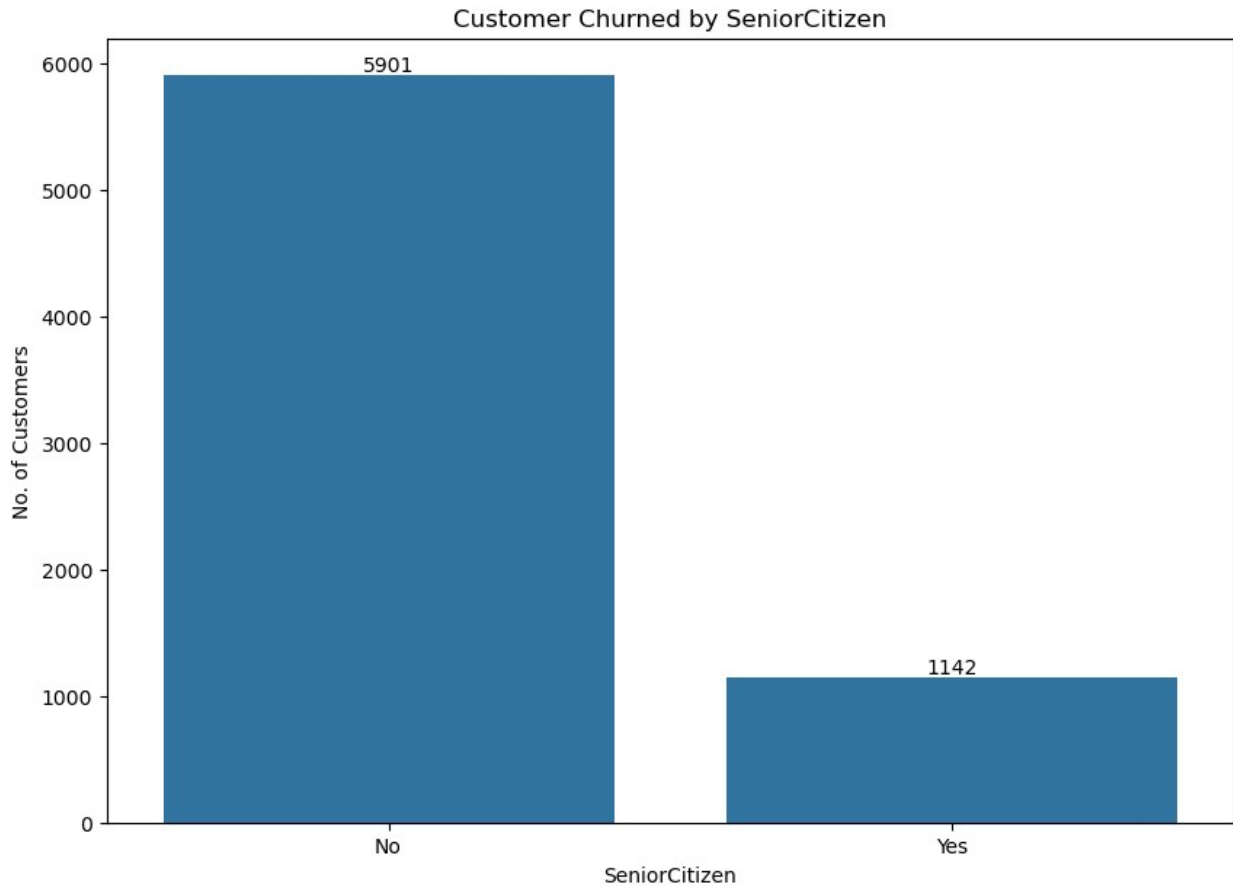
Senior Citizen churn from company or not?

```
plt.figure(figsize=(10,7))

ccg = sns.countplot(data=churn, x='SeniorCitizen')
plt.ylabel('No. of Customers')
plt.title('Customer Churned by SeniorCitizen')

for bars in ccg.containers:
    ccg.bar_label(bars)

plt.show()
```



```
# Step 1: Create a contingency table (counts)
counts = churn.groupby(['SeniorCitizen',
                        'Churn']).size().unstack(fill_value=0)

# Step 2: Convert counts to percentages
percentages = counts.div(counts.sum(axis=1), axis=0) * 100

# Step 3: Define labels and colors
labels = ['Not Senior Citizen', 'Senior Citizen']
churn_status = ['No', 'Yes']

# Step 4: Plot
plt.figure(figsize=(10, 7))
bottom = [0, 0] # To stack bars

for i, status in enumerate(churn_status):
    values = percentages[status].values
    plt.bar(labels, values, bottom=bottom, label=f'Churn: {status}')

    # Add percentage labels
    for j in range(len(values)):
        plt.text(j, bottom[j] + values[j]/2, f'{values[j]:0.0f}%',
```

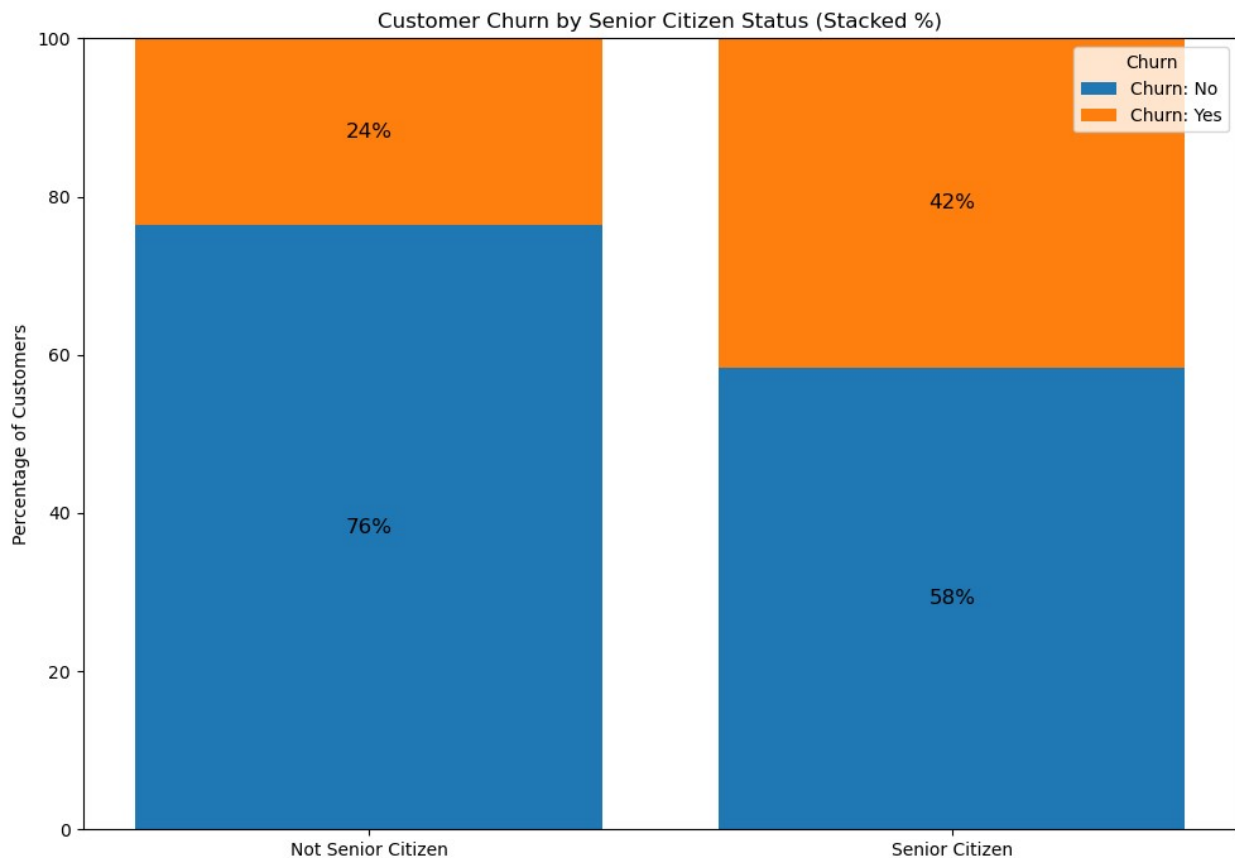
```

ha='center', va='center', fontsize=12)

    bottom = [bottom[k] + values[k] for k in range(len(values))]

# Step 5: Final formatting
plt.ylabel('Percentage of Customers')
plt.title('Customer Churn by Senior Citizen Status (Stacked %)')
plt.ylim(0, 100)
plt.legend(title='Churn')
plt.tight_layout()
plt.show()

```



42 percent of senior citizen churned out from our company compare to 23 percent from those who are not senior citizen.

How many customers churned out of our company whether there is dependents or not.

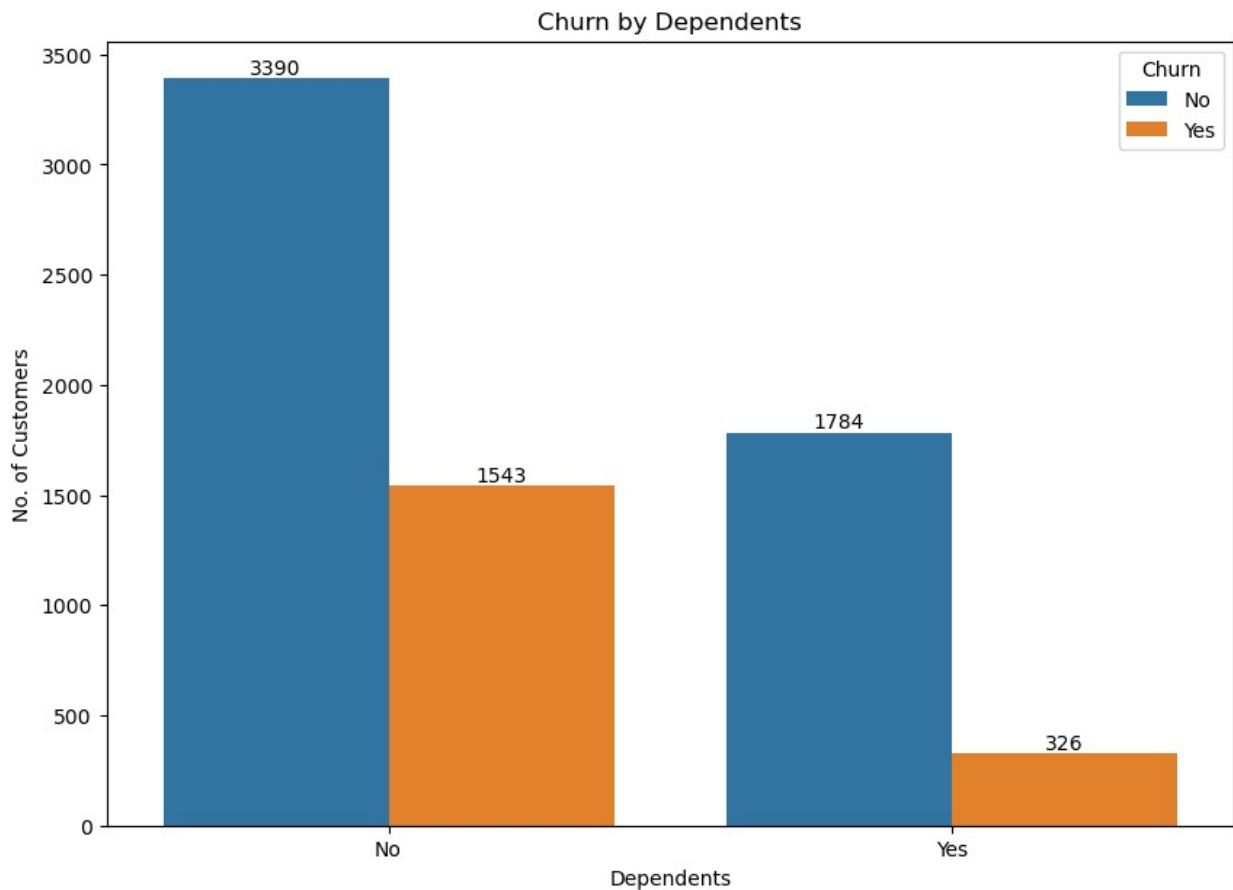
```

plt.figure(figsize=(10,7))
ccd = sns.countplot(data=churn,x='Dependents',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Dependents')

for bars in ccd.containers:

```

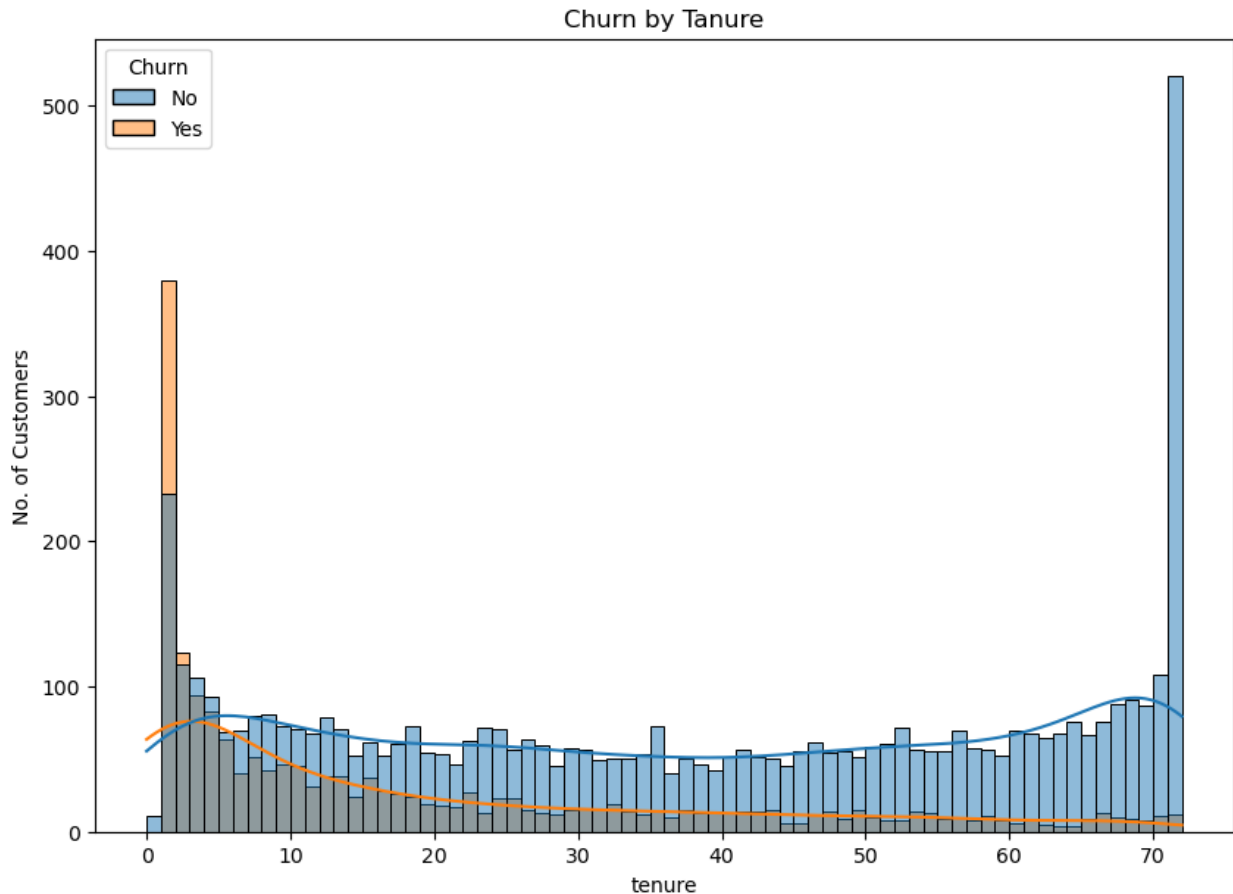
```
ccd.bar_label(bars)
plt.show()
```



Customers with no dependent are more likely to left the company.

Churn of cusomers based on tanure?

```
plt.figure(figsize=(10,7))
sns.histplot(data=churn,x='tenure',bins=72,kde=True,hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Tanure')
plt.show()
```

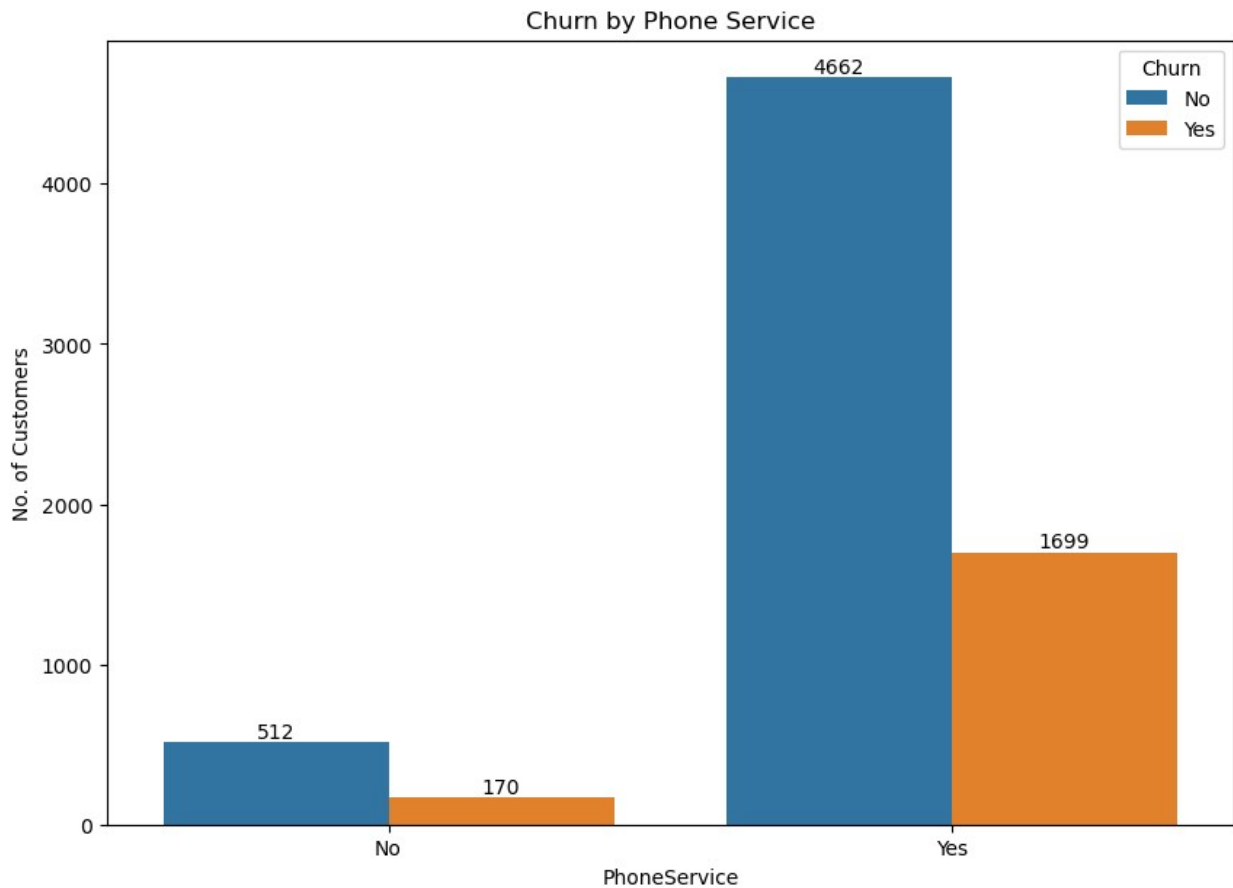


Customers who have used our services for a long time have stayed with us and customers who have used our services for 1 or 2 months have churned out from our company.

How many customers churned out from our company based on Phone Service?

```
plt.figure(figsize=(10,7))
ccps = sns.countplot(data=churn,x='PhoneService',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Phone Service')

for bars in ccps.containers:
    ccps.bar_label(bars)
plt.show()
```

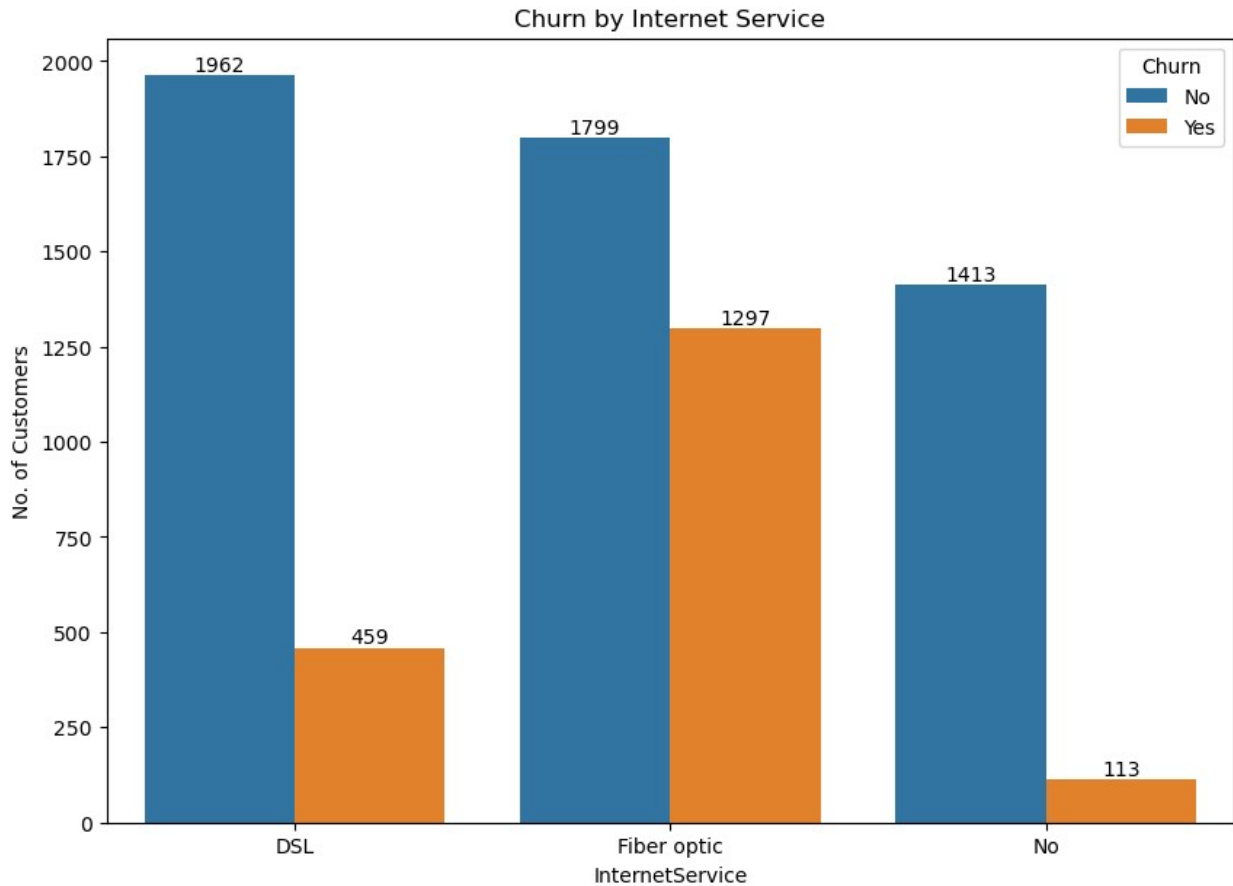



Customer those who have Phone Service as well are more likely to left the company.

How many customers churned out based on Internet Service?

```
plt.figure(figsize=(10,7))
ccis = sns.countplot(data=churn,x='InternetService',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Internet Service')

for bars in ccis.containers:
    ccis.bar_label(bars)
plt.show()
```

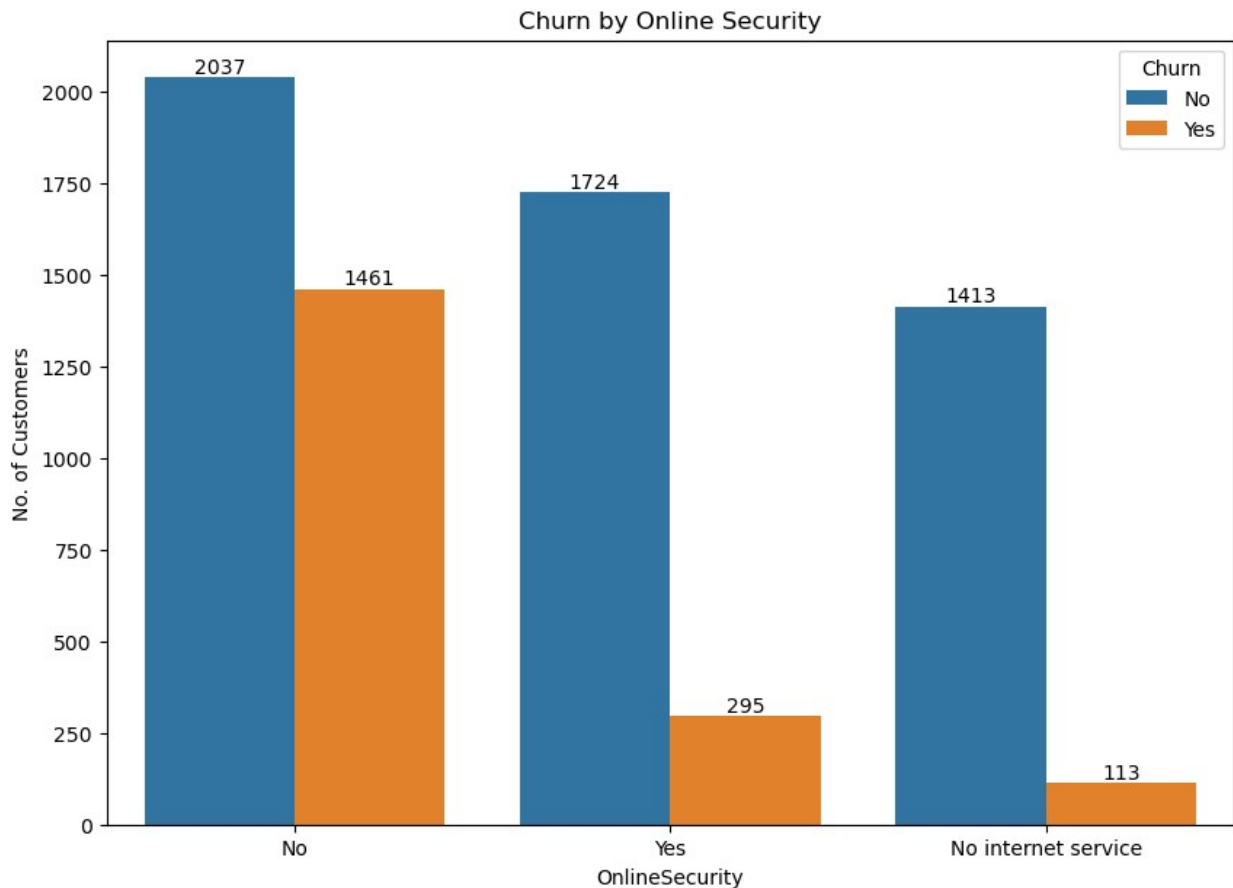


Most Customers with Fiber Optic connection are leaving our company followed with 'DSL' Connection type.

How many customers churned out based on whether they have Online Security or not?

```
plt.figure(figsize=(10,7))
ccis = sns.countplot(data=churn,x='OnlineSecurity',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Online Security')

for bars in ccis.containers:
    ccis.bar_label(bars)
plt.show()
```



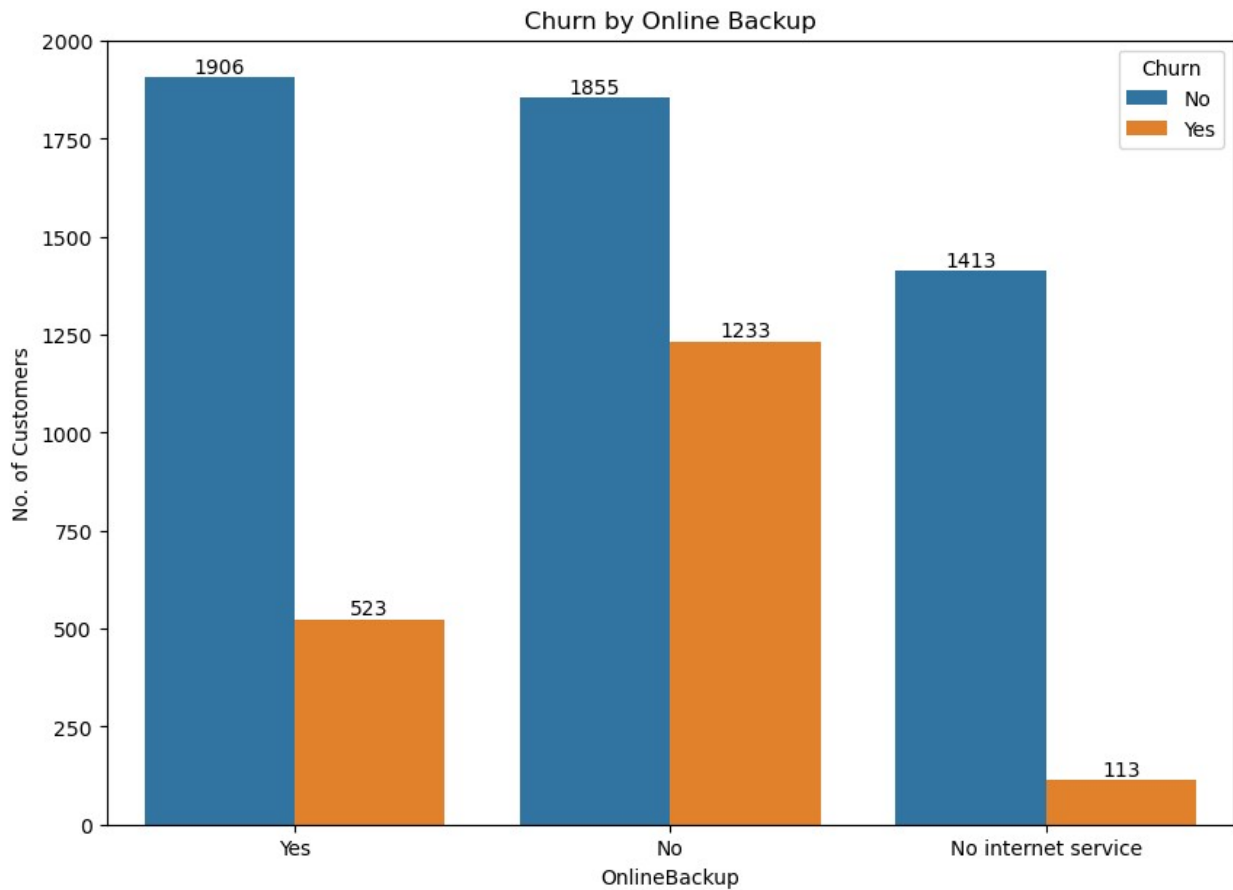
Customer those who don't have opted for online security are more likely to left the services of our company.

How many customers are opted for Online Backup and churned or not?

```
plt.figure(figsize=(10,7))
ccc = sns.countplot(data=churn,x='OnlineBackup',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Online Backup')

for bars in ccc.containers:
    ccc.bar_label(bars)

plt.show()
```



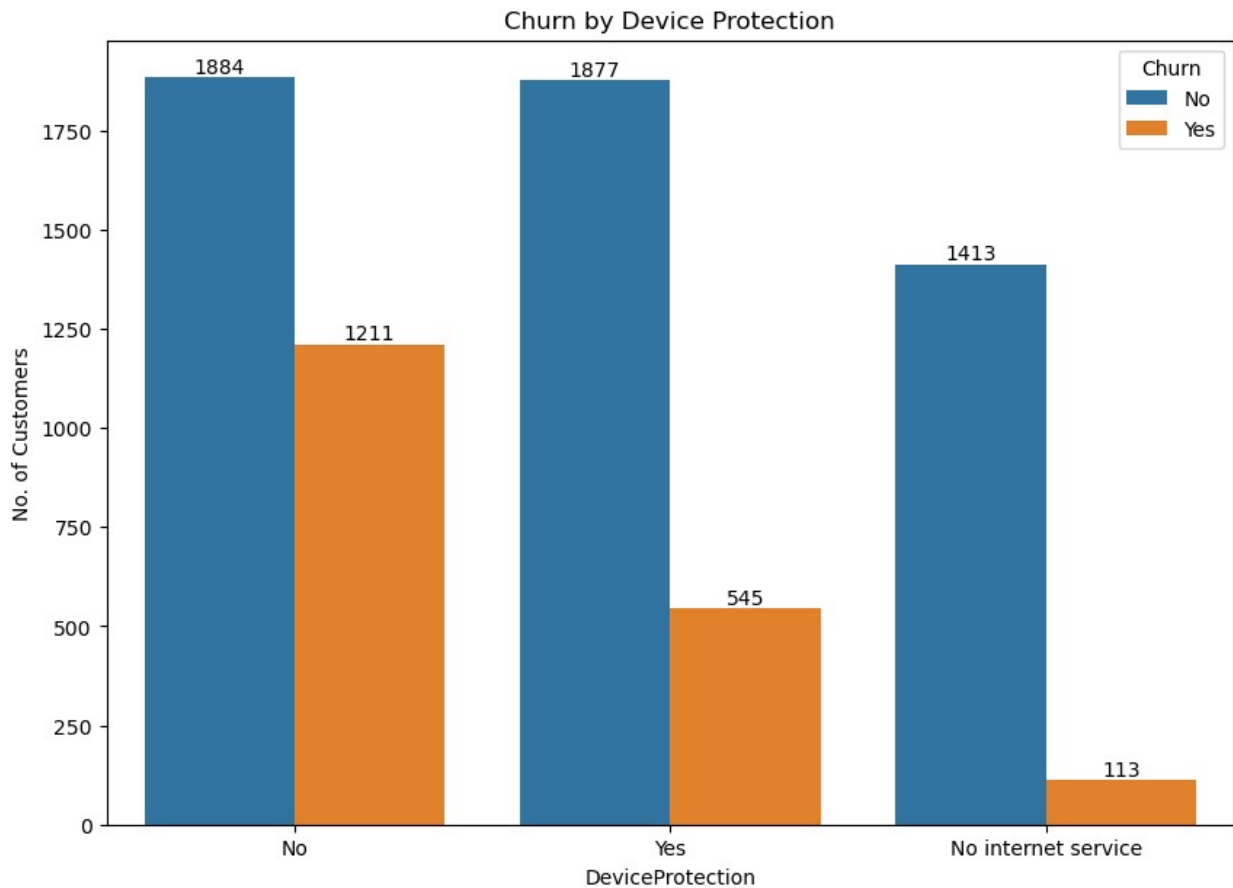
Most customer those who are not opting for online backup are likely to churned out.

How many customers are taking device protection with the connection?

```
plt.figure(figsize=(10,7))
ccc = sns.countplot(data=churn,x='DeviceProtection',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Device Protection')

for bars in ccc.containers:
    ccc.bar_label(bars)

plt.show()
```



Customers those who don't take device protection are likely to churn from are company.

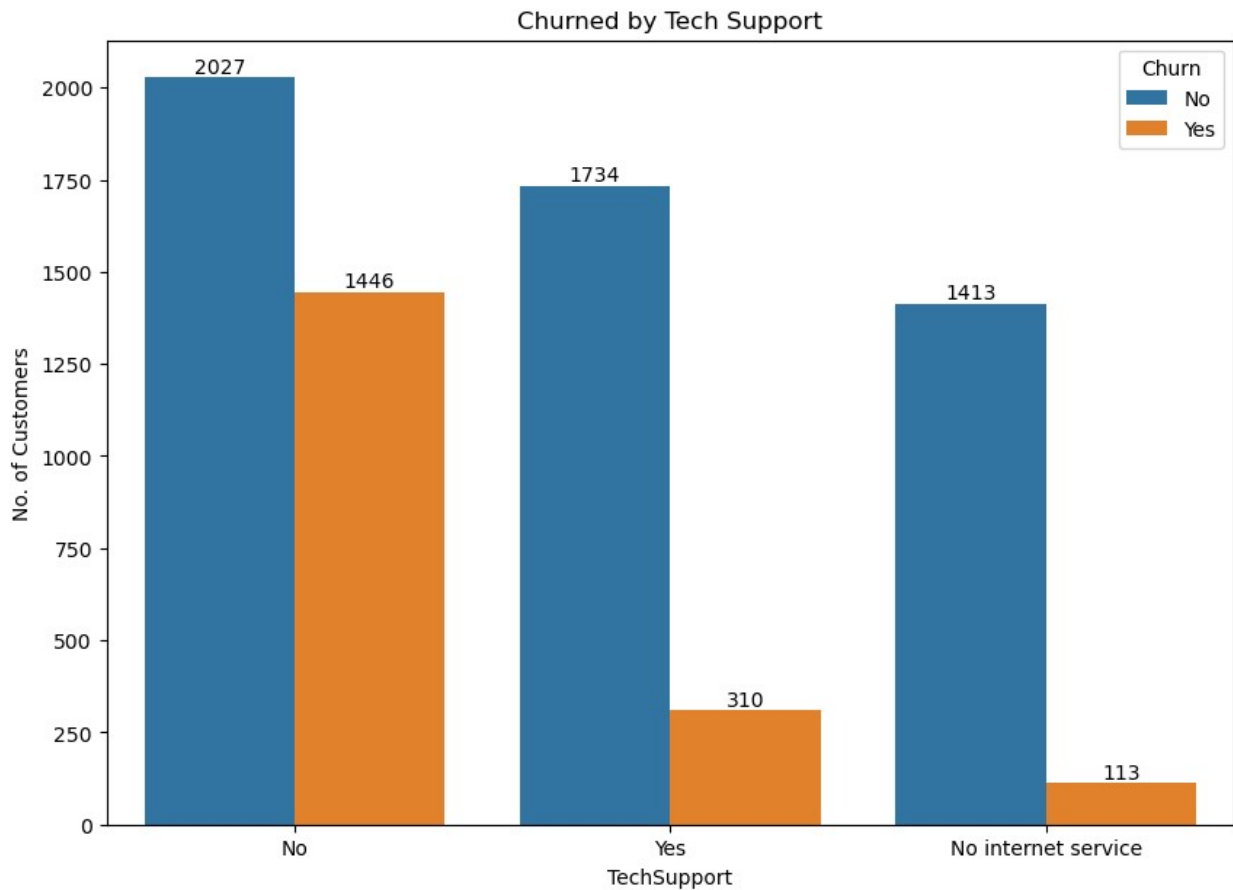
How many customers churned based on whether they have tech support or not?

```
plt.figure(figsize=(10,7))

ccts = sns.countplot(data=churn,x='TechSupport',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churned by Tech Support')

for bars in ccts.containers:
    ccts.bar_label(bars)

plt.show()
```



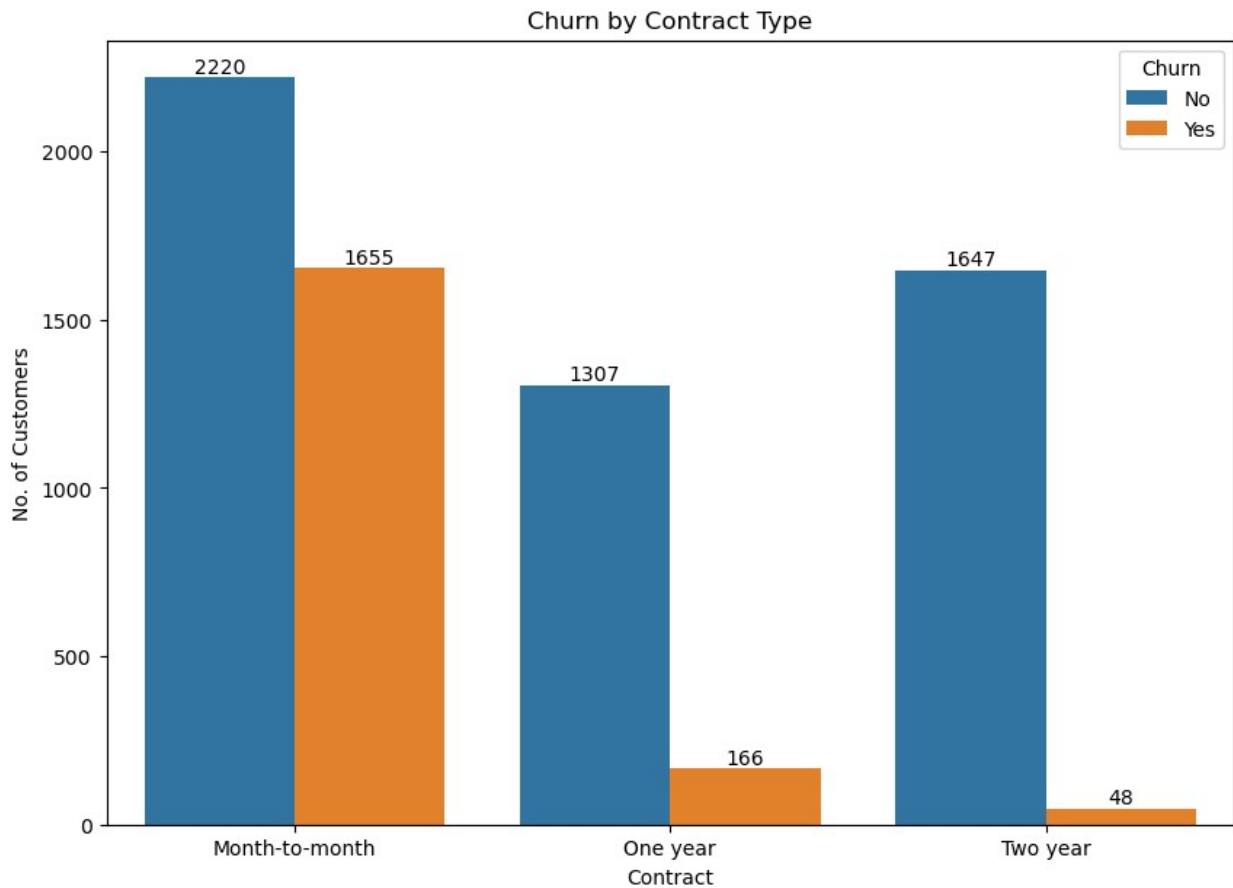
Those customers who have't opted for tech support are likely to churned out.

Customers churn based on contract or Plan Duration?

```
plt.figure(figsize=(10,7))
ccc = sns.countplot(data=churn,x='Contract',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Contract Type')

for bars in ccc.containers:
    ccc.bar_label(bars)

plt.show()
```



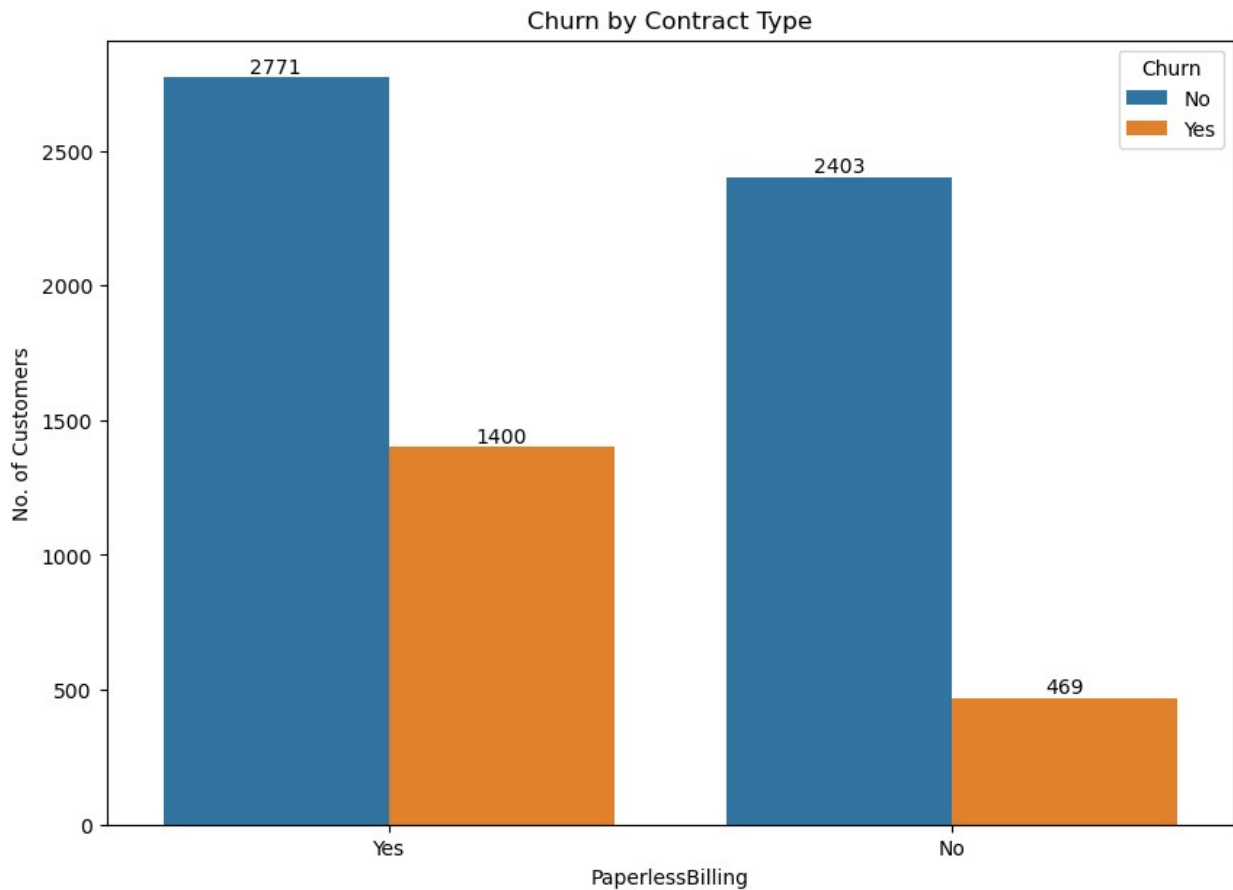
Customers with 'month to month' contract type are the highest who churned out from our company.

Customers Churned out based on paperless billing opted or not?

```
plt.figure(figsize=(10,7))
ccc = sns.countplot(data=churn,x='PaperlessBilling',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Contract Type')

for bars in ccc.containers:
    ccc.bar_label(bars)

plt.show()
```

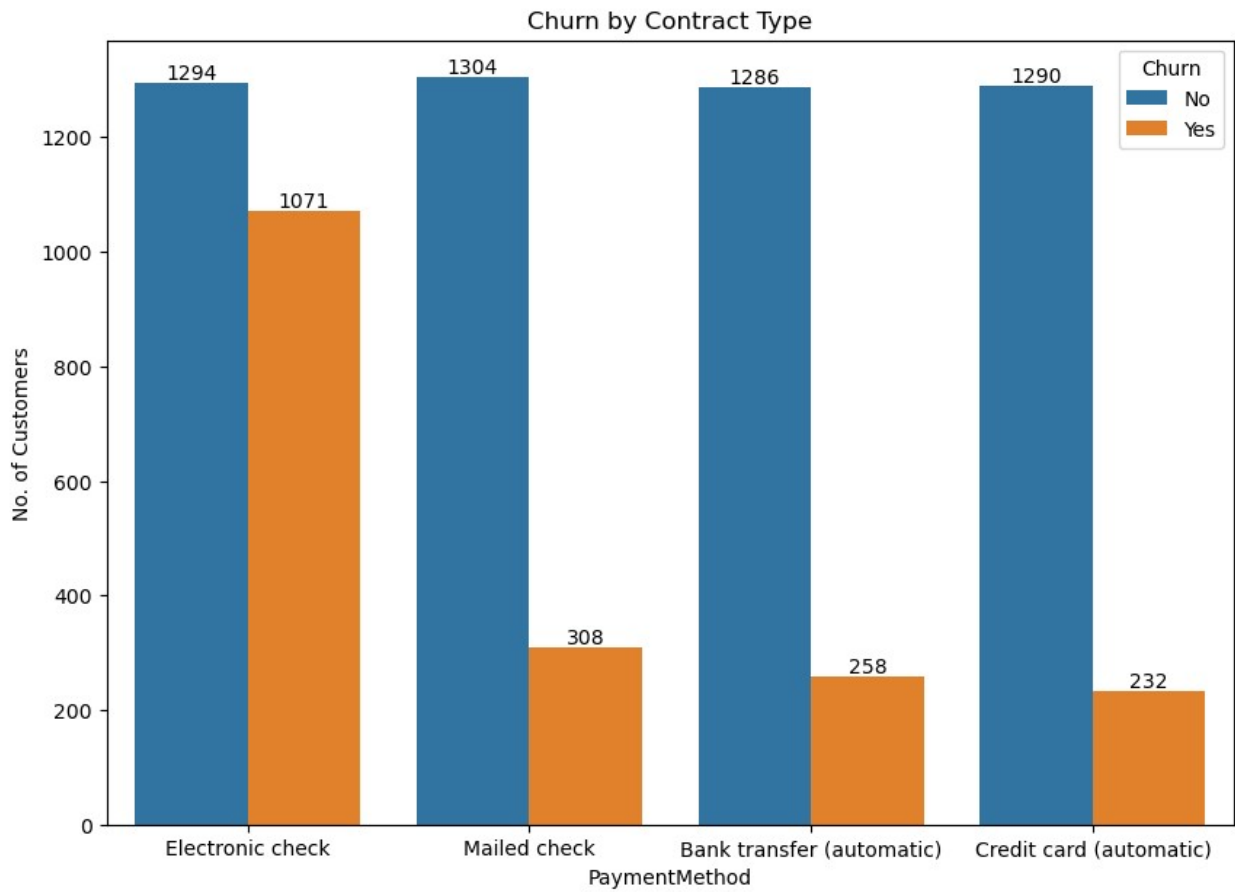
Customers those who opted for paperless billing are more likely to churn from our company.

How many customers churned out from the company based on payment method.

```
plt.figure(figsize=(10,7))
ccc = sns.countplot(data=churn,x='PaymentMethod',hue='Churn')
plt.ylabel('No. of Customers')
plt.title('Churn by Contract Type')

for bars in ccc.containers:
    ccc.bar_label(bars)

plt.show()
```



Customer those who are using Electronic Check as payment method are more likely to churn out from our company.