In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:
```
df = pd.read_csv("titanic (1).csv")
df.head()
```

Out[3]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0

In [4]:
```
df.shape # Dataset has 891 rows and 12 columns
```

Out[4]:
```
(891, 12)
```

In [5]:
```
df.dtypes
```

Out[5]:
```
PassengerId      int64
Survived         int64
Pclass           int64
Name            object
Sex             object
Age            float64
SibSp            int64
Parch            int64
Ticket          object
Fare           float64
Cabin           object
Embarked        object
dtype: object
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

In [7]:
```
df.isnull().sum()
```

Out[7]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [8]:
```
# age and cabin column have null values
```

In [9]:
```
df.duplicated().sum()
```

Out[9]:
```
0
```

In [10]:
```
# no duplicate value is found
```

In [11]:
```
df.describe()
```

Out[11]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329

In [12]:
```
df["PassengerId"].value_counts()
```

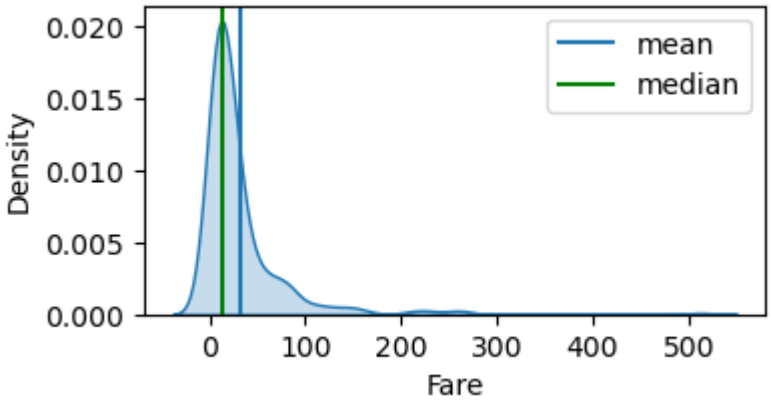
Out[12]:
```
PassengerId
1      1
599    1
588    1
589    1
590    1
      ..
301    1
302    1
303    1
304    1
891    1
Name: count, Length: 891, dtype: int64
```

- The dataset contains 891 records.
- The average age of passengers is 29, with the maximum age being 80 years.
- **The average fare is 32, which is significantly higher than the median fare of 14 — indicating that a few passengers paid very high fares, which pulled the mean upward.**

In [17]:
```
figure  = plt.figure(figsize=(4,2))

sns.kdeplot(x = df["Fare"], fill=True)
plt.axvline(np.mean(df["Fare"]), label="mean")
plt.axvline(np.median(df["Fare"]), label="median", color = "g")
plt.legend()
```

Out[17]:
```
<matplotlib.legend.Legend at 0x1c0d9a566c0>
```



In [18]:
```
# How many males and females were there?
print("Male and Female Counts")
df["Sex"].value_counts()
```

```
Male and Female Counts
```

Out[18]:
```
Sex
male      577
female    314
Name: count, dtype: int64
```

In [19]:
```
# How many survived vs not survive?
df["Survived"].value_counts()
```

Out[19]:
```
Survived
0    549
1    342
Name: count, dtype: int64
```

- Out of 891 passengers, only 342 survived, while the remaining 549 did not survive.

In [20]:
```
# Average age of passengers?
print("Average age of passenger:",np.mean(df["Age"]))
```

```
Average age of passenger: 29.69911764705882
```

In [21]:
```
# How many passengers have missing Age?
df["Age"].isnull().sum()
```

Out[21]:
```
177
```

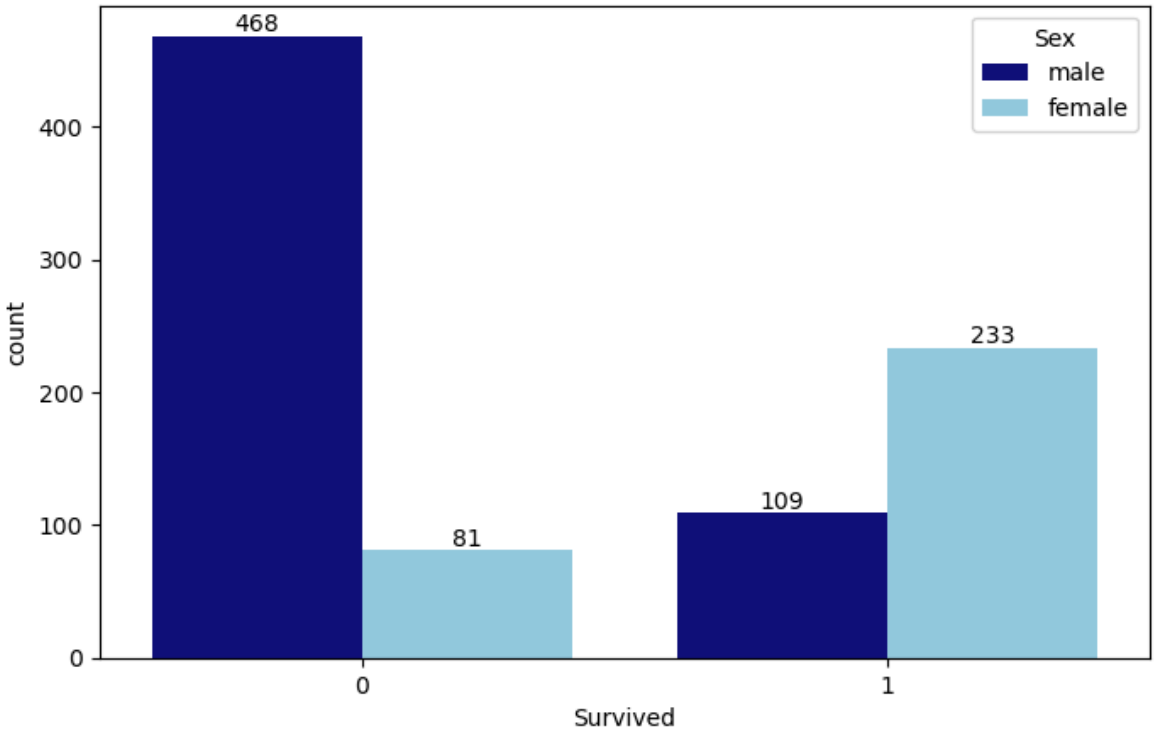
- The dataset contains 177 missing age values out of 891 total passengers.

In [22]:
```
# Survival rate of men vs women?
survival_rate  = df.groupby("Sex")["Survived"].mean()
survival_rate
```

Out[22]:
```
Sex
female    0.742038
male      0.188908
Name: Survived, dtype: float64
```

In [24]:
```
figure  = plt.figure(figsize=(8,5))
palette = ["darkblue","skyblue"]
ax = sns.countplot(x = "Survived", data=df, hue="Sex",palette=palette)
```

```
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.show()
```

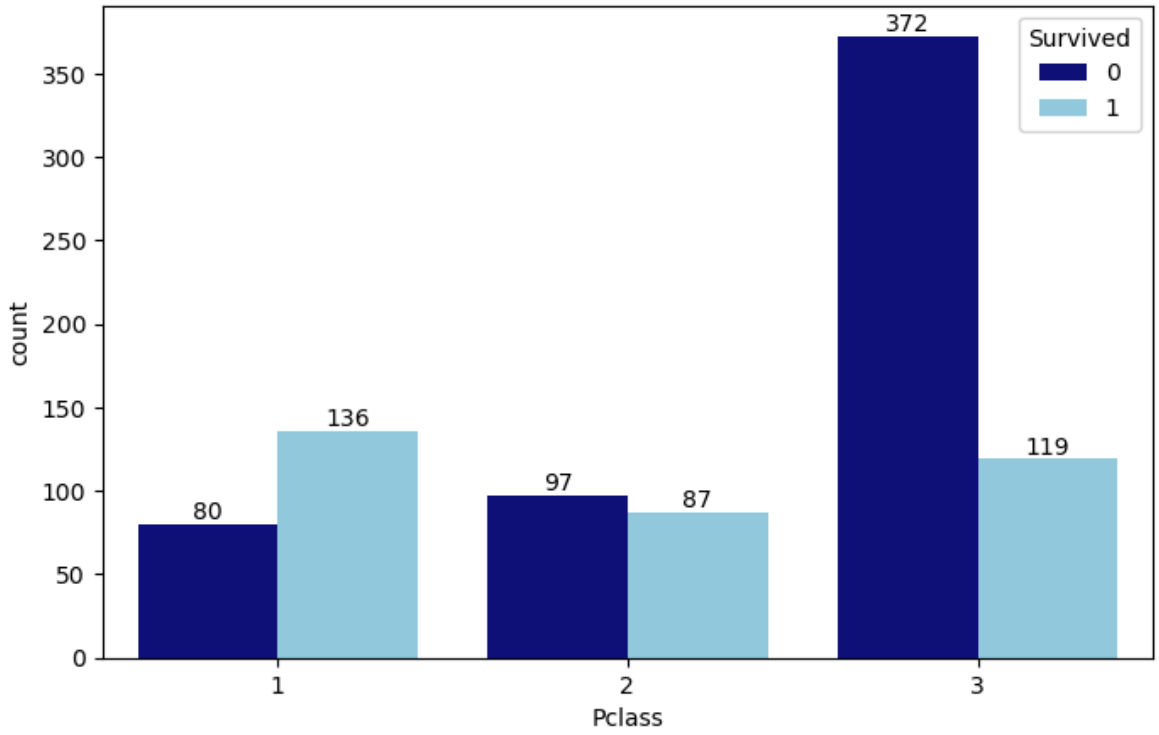


- Out of 314 female passengers, 233 survived, which is even higher than the number of surviving male passengers.

In [25]:
```
# Compare average fare by class (Pclass)
average_fare_by_class = df.groupby("Pclass")["Fare"].mean()
print("average fare by:",average_fare_by_class)
```

```
average fare by: Pclass
1    84.154687
2    20.662183
3    13.675550
Name: Fare, dtype: float64
```

In [26]:
```
figure  = plt.figure(figsize=(8,5))
palette = {0: "darkblue", 1: "skyblue"}
ax = sns.countplot(x = "Pclass", data=df, hue = "Survived",palette=palette)
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.show()
```



The average fare by class is as follows:

1st Class: 84.15

2nd Class: 20.66

3rd Class: 13.68

The fare for 3rd class is significantly lower compared to the other two classes, which likely explains why most passengers traveled in 3rd class.

In [27]:
```
#survival rate by passenger class?
sr = df.groupby("Pclass")["Survived"].mean()
print("survival rate by passenger class:",sr)
```

```
survival rate by passenger class: Pclass
1    0.629630
2    0.472826
3    0.242363
Name: Survived, dtype: float64
```

- The survival rate was highest among 1st class passengers, while the majority of deaths occurred in 3rd class.
- This suggests that passenger class had a significant impact on survival chances.

In [28]:
```
#the average age of survivors vs non-survivors?
avg_age = df.groupby("Survived")["Age"].mean()
avg_age
```

Out[28]:
```
Survived
0    30.626179
1    28.343690
Name: Age, dtype: float64
```

- The average age of survivors is 28, while the average age of non-survivors is 30.

In [59]:
```
# Did children (Age < 16) survive more than adults?
```

In [29]:
```
df["IsChhild"]= df["Age"]<16
```

In [30]:
```
df["IsChhild"].value_counts()
```

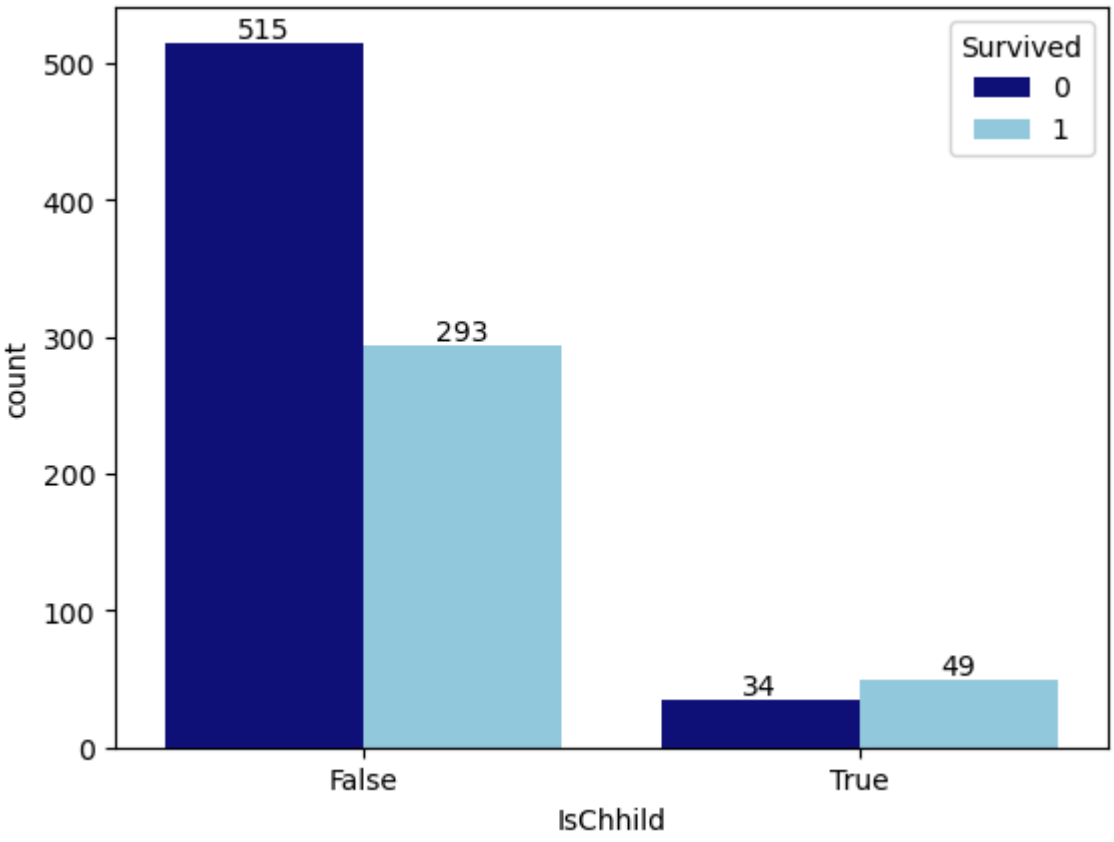
Out[30]:
```
IsChhild
False    808
True      83
Name: count, dtype: int64
```

In [31]:
```
IsChhild = df.groupby("Survived")["IsChhild"].sum()
IsChhild
```

Out[31]:
```
Survived
0    34
1    49
Name: IsChhild, dtype: int64
```

In [32]:
```
palette = ["darkblue","skyblue"]

ax = sns.countplot(x = "IsChhild", data = df, hue = "Survived",palette=palette)
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.show()
```



- There were a total of 84 children (under the age of 16), out of which 49 survived and the remaining 34 did not.

In [33]:
```
# Which port did most passengers embark from?
df['Embarked'].value_counts()
```

Out[33]:
```
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
```

In [34]:
```
# Which combinations had highest survival: Gender + Class?
df.groupby(['Sex', 'Pclass'])['Survived'].mean()
```

Out[34]:
```
Sex     Pclass
female  1         0.968085
        2         0.921053
        3         0.500000
male    1         0.368852
        2         0.157407
        3         0.135447
Name: Survived, dtype: float64
```

📄 Key Takeaways

- Survival was heavily influenced by gender, class, and to a lesser extent, age.
- Females and 1st class passengers had the highest survival chances.
- Children under 16 had better chances of survival than adults.
- 3rd class passengers paid the lowest fares but had the highest fatality rate.