```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

import seaborn as sns
from scipy import stats
```

```python
id = "1PazlhissU63pozkOjJckyjIJuM_u-0JF"
print("https://drive.google.com/uc?export=download&id=" + id)
```

https://drive.google.com/uc?export=download&id=1PazlhissU63pozkOjJckyjIJuM_u-0

```python
!wget "https://drive.google.com/uc?export=download&id=1PazlhissU63pozkOjJckyjIJuM_u
```

    --2022-04-26 16:58:14-- https://drive.google.com/uc?export=download&id=1Pazlh
    Resolving drive.google.com (drive.google.com)... 74.125.26.101, 74.125.26.138,
    Connecting to drive.google.com (drive.google.com)|74.125.26.101|:443... connec
    HTTP request sent, awaiting response... 303 See Other
    Location: https://doc-14-14-docs.googleusercontent.com/docs/securesc/ha0ro937g
    Warning: wildcards not supported in HTTP.
    --2022-04-26 16:58:15-- https://doc-14-14-docs.googleusercontent.com/docs/sec
    Resolving doc-14-14-docs.googleusercontent.com (doc-14-14-docs.googleuserconte
    Connecting to doc-14-14-docs.googleusercontent.com (doc-14-14-docs.googleuserc
    HTTP request sent, awaiting response... 200 OK
    Length: 12175 (12K) [text/csv]
    Saving to: 'flight.csv'

    flight.csv   100%[===================>] 11.89K --.-KB/s   in 0s

    2022-04-26 16:58:15 (57.7 MB/s) - 'flight.csv' saved [12175/12175]

```python
flights = pd.read_csv('./flight.csv')
flights.info()
```

    <class 'pandas.core.frame.DataFrame'>
    RangeIndex: 1000 entries, 0 to 999
    Data columns (total 3 columns):
     #   Column   Non-Null Count Dtype
    --- ------   -------------- -----
     0   Passenger_ID 1000 non-null   int64
     1   Flight_ID   1000 non-null   object
     2   Arrived   1000 non-null   int64
    dtypes: int64(2), object(1)
    memory usage: 23.6+ KB

```python
flights.head()
```

```python
sns.histplot(flights["Passenger_ID"], kde=True)
plt.show()
```

```python
flights["Arrived"].value_counts().plot.bar()
plt.grid()
plt.show()
```
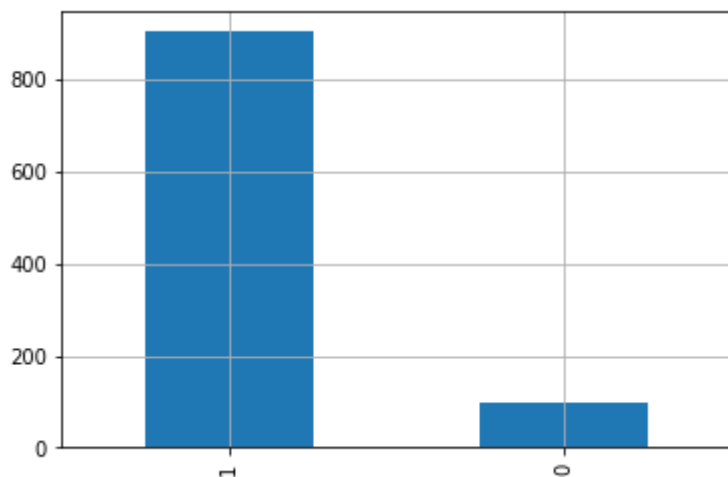


```python
showsup_probability = flights['Arrived'].value_counts(normalize=True)[1]
print(showsup_probability)
```

```
0.902
```

```python
flights['Arrived'].value_counts()
```

```
1    902
0     98
Name: Arrived, dtype: int64
```

```python
import math

PENALTY = 10000
def comb(n, r):

  num1 = math.factorial(n)
  num2 = math.factorial(r)
  num3 = math.factorial(n-r)

  return num1/(num2*num3)



def calculate_expected_penalty(ticket_sold):

    total_penalty = 0.0

    for i in range(1, ticket_sold - 100+1):
        ##pmf for k successes, n trials, p=success probab
        prob = stats.binom.pmf(k=100+i,n=ticket_sold,p=showsup_probability)
        penalty = prob*PENALTY*i
        total_penalty += penalty

    return total_penalty


for i in range(100, 150):
    sales = 5000*i
    penalty  = calculate_expected_penalty(i)
    netsales = (sales - penalty)
    print("Total seats:",i, ", Net Sales :",round(netsales))
```

```
Total seats: 100 , Net Sales : 500000
Total seats: 101 , Net Sales : 505000
Total seats: 102 , Net Sales : 509996
Total seats: 103 , Net Sales : 514979
Total seats: 104 , Net Sales : 519913
Total seats: 105 , Net Sales : 524725
Total seats: 106 , Net Sales : 529288
Total seats: 107 , Net Sales : 533425
Total seats: 108 , Net Sales : 536929
Total seats: 109 , Net Sales : 539603
Total seats: 110 , Net Sales : 541302
Total seats: 111 , Net Sales : 541959
Total seats: 112 , Net Sales : 541595
Total seats: 113 , Net Sales : 540305
Total seats: 114 , Net Sales : 538233
Total seats: 115 , Net Sales : 535544
Total seats: 116 , Net Sales : 532393
Total seats: 117 , Net Sales : 528919
Total seats: 118 , Net Sales : 525227
Total seats: 119 , Net Sales : 521398
Total seats: 120 , Net Sales : 517484
Total seats: 121 , Net Sales : 513521
Total seats: 122 , Net Sales : 509531
Total seats: 123 , Net Sales : 505526
```

```
Total seats: 124 , Net Sales : 501514
Total seats: 125 , Net Sales : 497497
Total seats: 126 , Net Sales : 493479
Total seats: 127 , Net Sales : 489459
Total seats: 128 , Net Sales : 485440
Total seats: 129 , Net Sales : 481420
Total seats: 130 , Net Sales : 477400
Total seats: 131 , Net Sales : 473380
Total seats: 132 , Net Sales : 469360
Total seats: 133 , Net Sales : 465340
Total seats: 134 , Net Sales : 461320
Total seats: 135 , Net Sales : 457300
Total seats: 136 , Net Sales : 453280
Total seats: 137 , Net Sales : 449260
Total seats: 138 , Net Sales : 445240
Total seats: 139 , Net Sales : 441220
Total seats: 140 , Net Sales : 437200
Total seats: 141 , Net Sales : 433180
Total seats: 142 , Net Sales : 429160
Total seats: 143 , Net Sales : 425140
Total seats: 144 , Net Sales : 421120
Total seats: 145 , Net Sales : 417100
Total seats: 146 , Net Sales : 413080
Total seats: 147 , Net Sales : 409060
Total seats: 148 , Net Sales : 405040
Total seats: 149 , Net Sales : 401020
```

✓   0s   completed at 22:42   ● ✕