Importing Libraries

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

In [3]:
```
from scipy.stats import chi2 # Distribution (cdf etc.)
from scipy.stats import chisquare # Statistical test (chistat, pvalue)
from scipy.stats import chi2_contingency # Categorical Vs Categorical
from scipy.stats import ttest_rel,ttest_1samp
from scipy.stats import binom,t
```

Chi Square Test (Test of independance)

In [6]:
```
# Ho : Gender Doesn't affect( Independant)
# Ha : Gender Affect( Dependant)
observed =[[527,72],[206,102]]
chi_stat,p_value,dof,expected=chi2_contingency(observed)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
print("dof : ",dof)
print("expected : ",expected)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
    print("Conclusion : Gender Affects the buying pattern")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  57.04098674049609
p_value :  4.268230756875865e-14
dof :  1
expected :  [[484.08710033 114.91289967]
 [248.91289967  59.08710033]]
Interpretation : Reject Ho
Conclusion : Gender Affects the buying pattern
```

Aerofit

In [44]:
```
df=pd.read_csv("aerofit.csv")
df
```

Out[44]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	18	Male	14	Single	3	4	29562	112
1	KP281	19	Male	15	Single	2	3	31836	75
2	KP281	19	Female	14	Partnered	4	3	30699	66
3	KP281	19	Male	12	Single	3	3	32973	85
4	KP281	20	Male	13	Partnered	4	2	35247	47
...	...	...	...	...	...	...	...	...	...
175	KP781	40	Male	21	Single	6	5	83416	200
176	KP781	42	Male	18	Single	5	4	89641	200
177	KP781	45	Male	16	Single	5	5	90886	160
178	KP781	47	Male	18	Partnered	4	5	104581	120
179	KP781	48	Male	18	Partnered	4	5	95508	180

180 rows × 9 columns

Gender Vs Product

In [ ]:
```

```

In [30]:
```
gender_product=pd.crosstab(columns=df["Product"],index=df["Gender"])
gender_product
```

Out[30]:

Product	KP281	KP481	KP781
Gender			
Female	40	29	7
Male	40	31	33

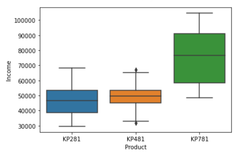
In [31]:
```
# Ho : Gender Doesnt affect ( independant)
# Ha : Gender Affects buying pattern ( dependant)


chi_stat,p_value,dof,expected_freq=chi2_contingency(gender_product)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
print("dof : ",dof)
print("expected_freq : ",expected_freq)
alpha = 0.05
if p_value <alpha :
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  12.923836023388664
p_value :  0.0015617972833158714
dof :  2
expected_freq :  [[33.77777778 25.33333333 16.88888889]
 [46.22222222 34.66666667 23.11111111]]
Interpretation : Reject Ho
```

product vs Income

In [32]:
```
sns.boxplot(x=df["Product"],y=df["Income"])
```

Out[32]:
```
<AxesSubplot:xlabel='Product', ylabel='Income'>
```



In [33]:
```
bins= [0 , df["Income"].median(),df["Income"].max()]
labels = ["low","high"]
df["income_bin"]=pd.cut(x=df["Income"],bins=bins, labels=labels)
df
```

Out[33]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles	income_bin
0	KP281	18	Male	14	Single	3	4	29562	112	low
1	KP281	19	Male	15	Single	2	3	31836	75	low
2	KP281	19	Female	14	Partnered	4	3	30699	66	low
3	KP281	19	Male	12	Single	3	3	32973	85	low
4	KP281	20	Male	13	Partnered	4	2	35247	47	low
...	...	...	...	...	...	...	...	...	...	...
175	KP781	40	Male	21	Single	6	5	83416	200	high
176	KP781	42	Male	18	Single	5	4	89641	200	high
177	KP781	45	Male	16	Single	5	5	90886	160	high
178	KP781	47	Male	18	Partnered	4	5	104581	120	high
179	KP781	48	Male	18	Partnered	4	5	95508	180	high

180 rows × 10 columns

In [37]:
```
income_product=pd.crosstab(columns=df["Product"],index=df["income_bin"],margins=True)
income_product
```

Out[37]:

Product	KP281	KP481	KP781	All
income_bin				
low	50	35	5	90
high	30	25	35	90
All	80	60	40	180

In [36]:
```
# Ho : Income Doesnt affect ( independant)
# Ha : Income Affects buying pattern ( dependant)


chi_stat,p_value,dof,expected_freq=chi2_contingency(income_product)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
print("dof : ",dof)
print("expected_freq : ",expected_freq)
alpha = 0.05
if p_value <alpha :
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  29.166666666666668
p_value :  4.640222409769401e-07
dof :  2
expected_freq :  [[40. 30. 20.]
 [40. 30. 20.]]
Interpretation : Reject Ho
```

Gender vs Income

In [40]:
```
income_gender=pd.crosstab(columns=df["Gender"],index=df["income_bin"])
income_gender
```

Out[40]:

Gender	Female	Male
income_bin		
low	46	44
high	30	60

In [41]:
```
# Ho : Gender Doesnt affect Income( independant)
# Ha : Gender Affects Income ( dependant)

chi_stat,p_value,dof,expected_freq=chi2_contingency(income_gender)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
print("dof : ",dof)
print("expected_freq : ",expected_freq)
alpha = 0.05
if p_value <alpha :
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  5.123987854251013
p_value :  0.023597328751612023
dof :  1
expected_freq :  [[38. 52.]
 [38. 52.]]
Interpretation : Reject Ho
```

In [43]:
```
chi2.ppf(0.95,df=1)
```

Out[43]:
```
3.841458820694124
```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:
```

```

In [47]:
```
3.5+(1.28*((0.7)/np.sqrt(45)))
```

Out[47]:
```
3.6335677938559874
```

In [48]:
```
3.72+(1.28*((0.7)/np.sqrt(45)))
```

Out[48]:
```
3.8535677938559876
```

In [49]:
```
3.5+(1.28*((0.7)))
```

Out[49]: 4.396

In [ ]: