Importing Libraries

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

In [43]:
```
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
```

T Test Rel

In [3]:
```
df=pd.read_csv("problem_solving.csv")
df
```

Out[3]:

	id	test_1	test_2
0	0	40	38
1	1	49	44
2	2	65	69
3	3	59	63
4	4	44	43
...	...	...	...
132	132	45	44
133	133	46	42
134	134	40	35
135	135	60	66
136	136	79	84

137 rows × 3 columns

In [4]:
```
df["test_1"].mean()
```

Out[4]:
```
60.48905109489051
```

In [5]:
```
df["test_2"].mean()
```

Out[5]:
```
62.43065693430657
```

In [8]:
```
# Ho : mu1 = mu2 ( There is no effect of interview prep session or problem solving session)
# Ha : mu1 < mu2 ( There is a significant improvement in the test score/ Problem Solving session was effective)
t_stat,p_value=ttest_rel(df["test_1"],df["test_2"],alternative="less")
print("t_stat : ",t_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
t_stat :  -5.502886353508166
p_value :  8.979201768961566e-08
Interpretation : Reject Ho
```

In [10]:
```
np.mean(df["test_1"]-df["test_2"])
```

Out[10]:
```
-1.9416058394160585
```

In [13]:
```
# Ho : mu1 - mu2 = 0 ( There is no effect of interview prep session or problem solving session)
# Ha : mu1 - mu2 < 0( There is a significant improvement in the test score/ Problem Solving session was effective)
t_stat,p_value=ttest_1samp(df["test_1"]-df["test_2"],0,alternative="less")
print("t_stat : ",t_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
t_stat :  -5.502886353508166
p_value :  8.979201768961566e-08
Interpretation : Reject Ho
```

In [14]:
```
# Ho : mu2 - mu1 = 0 ( There is no effect of interview prep session or problem solving session)
# Ha : mu2 - mu1 > 0( There is a significant improvement in the test score/ Problem Solving session was effective)
t_stat,p_value=ttest_1samp(df["test_2"]-df["test_1"],0,alternative="greater")
print("t_stat : ",t_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
t_stat :  5.502886353508166
p_value :  8.979201768961566e-08
Interpretation : Reject Ho
```

Chi Square Test

In [19]:
```
1-binom.cdf(n=50,k=28,p=0.5)
```

Out[19]:
```
0.16111816017877345
```

In [20]:
```
1-binom.cdf(n=50,k=45,p=0.5)
```

Out[20]:
```
2.2308910274659866e-10
```

In [21]:
```
(((28-25)**2)/25)+(((22-25)**2)/25)
```

Out[21]:
```
0.72
```

In [24]:
```
# Ho : coin is Fair
# Ha : Coin is biased
chi_stat=(((28-25)**2)/25)+(((22-25)**2)/25)
p_value=1-chi2.cdf(chi_stat,df=1)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  0.72
p_value :  0.3961439091520741
Interpretation : Fail to Reject Ho
```

In [26]:
```
# Ho : coin is Fair
# Ha : Coin is biased
chi_stat,p_value=chisquare([28,22],[25,25])
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  0.72
p_value :  0.3961439091520741
Interpretation : Fail to Reject Ho
```

In [28]:
```
critival_chi_stat= chi2.ppf(0.95,df=1)
print("critival_chi_stat : ",critival_chi_stat)
```

```
critival_chi_stat :  3.841458820694124
```

In [29]:
```
# Ho : coin is Fair
# Ha : Coin is biased
chi_stat,p_value=chisquare([45,5],[25,25])
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  32.0
p_value :  1.5417257900280013e-08
Interpretation : Reject Ho
```

In [32]:
```
# Ho : coin is Fair
# Ha : Coin is biased
chi_stat,p_value=chisquare([45,5],[25,25])
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
alpha = 0.05
if p_value< alpha:
    print("Interpretation : Reject Ho")
else:
    print("Interpretation : Fail to Reject Ho")
```

```
chi_stat :  32.0
p_value :  1.5417257900280013e-08
Interpretation : Reject Ho
```

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Aerofit

Gender Vs Product

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

Out[40]:

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

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


chi_stat,p_value,df,expected_freq=chi2_contingency(gender_product)
print("chi_stat : ",chi_stat)
print("p_value : ",p_value)
print("df : ",df)
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 :  12.923836032388664
p_value :  0.0015617972833158714
df :  2
expected_freq :  [[33.77777778 25.33333333 16.88888889]
 [46.22222222 34.66666667 23.11111111]]
Interpretation : Reject Ho
```

Income vs Product

Income vs Gender

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: