

-----import libraries-----

```
import pandas as pd
import numpy as np
from scipy import stats
from scipy.stats import norm
```

-----read dataset-----

```
data = pd.read_csv('Downloads/BuyerRatio.csv')
data
```

	Observed Values	East	West	North	South
0	Males	50	142	131	70
1	Females	435	1523	1356	750

-----drop-----

```
data = data.iloc[:,1:]
data
```

	East	West	North	South
0	50	142	131	70
1	435	1523	1356	750

```
data.values
```

```
array([[ 50, 142, 131, 70],
       [435, 1523, 1356, 750]], dtype=int64)
```

```
val = stats.chi2_contingency(data)
```

```
val
```

---

```
(1.595945538661058,
 0.6603094907091882,
 3,
 array([[ 42.76531299, 146.81287862, 131.11756787, 72.30424052],
        [ 442.23468701, 1518.18712138, 1355.88243213, 747.69575948]]))
```

---

```
rows = len(data.iloc[0:2,0])
columns = len(data.iloc[0,0:4])
dof = (rows-1)*(columns-1)
print('Degree of Freedom',dof)
```

---

### Degree of Freedom 3

---

```
expectedvalue = val[3]
```

```
expectedvalue
```

---

```
array([[ 42.76531299, 146.81287862, 131.11756787,  72.30424052],  
       [ 442.23468701, 1518.18712138, 1355.88243213,  747.69575948]])
```

```
from scipy.stats import chi2
```

```
chi2 = sum([(o-e)**2/e for o,e in zip(data.values,expectedvalue)])
```

```
chi2_statistics = chi2[0] + chi2[1]
```

```
chi2_statistics
```

---

```
1.5152956451130446
```

```
pvalue = 1-chi2.cdf(chi2_statistics,3)
```

```
pvalue
```

```
0.678744629467897
```

```
if pvalue <=0.05:
```

```
    print('Dependent (reject H0)')
```

```
else:
```

```
    print('Independent (fail to reject H0)')
```

```
Independent (fail to reject H0)
```