**1. Cutlets.mtw**

Business problem- To calculate significant difference in the diameter of the cutlet between two units.

Data collection- Given, significance level =0.05

X is Discrete with 2 variables.

Y is continuous (Diameter).

Normality Test-

H0: No action, Data is normal.

H1: Take Action, Data is not normal.

Probability Plot of Unit A



Probability Plot of Unit B



By seeing plot, we can say that data is normally Distributed.

P value for unit A = 0.287>0.05 (H0 will be selected.)

P value for unit B = 0.687 >0.05

Now, here the external condition is not same because both units are selected randomly from different conditions.

So, perform variance test,

H0: Variance of unit A = Variance of unit B

H1: Variance of unit A != Variance of unit B

Test and CI for One Variance: Unit A, Unit B

Test

|  |  |
| --- | --- |
| Null hypothesis | H₀: σ = 1 |
| Alternative hypothesis | H₁: σ > 1 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Method | Test Statistic | DF | P-Value |
| Unit A | Bonett | — | — | 1.000 |
|  | Chi-Square | 2.83 | 34 | 1.000 |
| Unit B | Bonett | — | — | 1.000 |
|  | Chi-Square | 4.01 | 34 | 1.000 |

Here P value >0.05 so H0 will selected.

Variances are equal, perform 2 sample T test.

H0: Avg of unit A = Avg of unit B

H1: Avg of unit A != Avg of unit B

Two-Sample T-Test and CI: Unit A, Unit B

Method

|  |
| --- |
| μ₁: mean of Unit A |
| µ₂: mean of Unit B |
| Difference: μ₁ - µ₂ |

*Equal variances are not assumed for this analysis.*

Descriptive Statistics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample | N | Mean | StDev | SE Mean |
| Unit A | 35 | 7.019 | 0.288 | 0.049 |
| Unit B | 35 | 6.964 | 0.343 | 0.058 |

Estimation for Difference

|  |  |
| --- | --- |
| Difference | 95% Lower Bound for Difference |
| 0.0548 | -0.0717 |

Test

|  |  |
| --- | --- |
| Null hypothesis | H₀: μ₁ - µ₂ = 0 |
| Alternative hypothesis | H₁: μ₁ - µ₂ > 0 |

|  |  |  |
| --- | --- | --- |
| T-Value | DF | P-Value |
| 0.72 | 66 | 0.236 |

Here, P value >0.05, select H0.

So, Avg of unit A & unit B cutlet diameter is same.

**2. Labtat.mtw**

Business Problem: To determine whether there is any difference in the average Turn Around Time (TAT) of reports of the laboratories on their preferred list.

Data collection- Given, significance level =0.05

X is Discrete with 4 variables.

Y is continuous (Time).

Normality Test:

H0: No action, Data is normal.

H1: Take Action, Data is not normal.

All variables P value is >0.05 hence H0 will select, ie. Data is normal.

Now perform varience test,

H0: no action, all variance is same.

H1: Take action, all Varience is not same.

After performing test in minitab variance is same for all the vaariables.

So select null hypothesis and reject H1,ie. Varience is same.

Now perform ANOVA,

H0; No action, avg TAT is same.

H1: Take action, Avg TAT is Different.

One-way ANOVA: Laboratory 1, Laboratory 2, Laboratory ... oratory 4

Method

|  |  |
| --- | --- |
| Null hypothesis | All means are equal |
| Alternative hypothesis | Not all means are equal |
| Significance level | α = 0.05 |

*Equal variances were assumed for the analysis.*

Factor Information

|  |  |  |
| --- | --- | --- |
| Factor | Levels | Values |
| Factor | 4 | Laboratory 1, Laboratory 2, Laboratory 3, Laboratory 4 |

Analysis of Variance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | DF | Adj SS | Adj MS | F-Value | P-Value |
| Factor | 3 | 79979 | 26659.7 | 118.70 | 0.000 |
| Error | 476 | 106905 | 224.6 |  |  |
| Total | 479 | 186884 |  |  |  |

Model Summary

|  |  |  |  |
| --- | --- | --- | --- |
| S | R-sq | R-sq(adj) | R-sq(pred) |
| 14.9863 | 42.80% | 42.44% | 41.83% |

Means

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Factor | N | Mean | StDev | 95% CI |
| Laboratory 1 | 120 | 178.36 | 13.17 | (175.67, 181.05) |
| Laboratory 2 | 120 | 178.90 | 14.96 | (176.21, 181.59) |
| Laboratory 3 | 120 | 199.91 | 16.54 | (197.23, 202.60) |
| Laboratory 4 | 120 | 163.68 | 15.09 | (160.99, 166.37) |

*Pooled StDev = 14.9863*



Here, from graph and Pvalue<0.05,

Select H1 and reject H0.

Means, There is avg TAT differece in 4 Lab reports.

**3. Buyer Ratio.mtw**

Business Problem- To find the ratios of product sales in all region is same or not.

Data Collection- Given,

Y is discrete categorical.

X is Discrete with 4 variables.

Normality test:

H0: No action, Data is normal.

H1: Take Action, Data is not normal.

P value>0.05, P High Null fly.

Data is Normal.

So, we can perform chi-squared Test.

H0: All Avg product sales ratios is same in all regions.

H1: Avg product sales ratios is different in all regions.

Tabulated Statistics: Worksheet rows, Worksheet columns

Rows: Worksheet rows   Columns: Worksheet columns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | East | West | North | South | All |
|  |  |  |  |  |  |
| 1 | 50 | 142 | 131 | 70 | 393 |
| 2 | 435 | 1523 | 1356 | 750 | 4064 |
| All | 485 | 1665 | 1487 | 820 | 4457 |

*Cell Contents  
      Count*

Chi-Square Test

|  |  |  |  |
| --- | --- | --- | --- |
|  | Chi-Square | DF | P-Value |
| Pearson | 1.596 | 3 | 0.660 |
| Likelihood Ratio | 1.535 | 3 | 0.674 |

H0 is selected.

P High Null Fly, means All the product sales ratios is same in all the region.

4. **CustomerOrderForm.mtw**

Business Problem- To check defects varies or not for customer order form in all centres.

Data Collection- Given,

Significance level=0.05

Y is discrete, X is Discrete with 4 variables.

Chi-squared test:

H0: Defects in customer order form in all of the centres are same.

H1: Defects in customer order form in any two of the centres are not same.

Chi-Square Test

|  |  |  |  |
| --- | --- | --- | --- |
|  | Chi-Square | DF | P-Value |
| Pearson | 3.859 | 3 | 0.277 |
| Likelihood Ratio | 4.084 | 3 | 0.253 |

Here, P high Null fly.

Means, select H0- Defects in customer order form in all of the centres are same.

5. **Fantaloons.mtw**

Business Problem- To find the proportion of the male vs female walking’s is differs or not on weekdays and weekends.

Data Collection- Given,

Significance level=0.05

X is Discrete with 2 variables

Y is Discrete.

2 proportion Table,

H0: proportion of male vs females walking in weekdays is equal to weekends.

H1: proportion of male vs females walking in weekdays is different than weekends.

Test and CI for Two Proportions: Weekdays, Weekend

Method

|  |
| --- |
| Event: Male |
| p₁: proportion where Weekdays = Male |
| p₂: proportion where Weekend = Male |
| Difference: p₁ - p₂ |

Descriptive Statistics

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | N | Event | Sample p |
| Weekdays | 400 | 113 | 0.282500 |
| Weekend | 400 | 167 | 0.417500 |

Estimation for Difference

|  |  |
| --- | --- |
| Difference | 95% CI for Difference |
| -0.135 | (-0.200438, -0.069562) |

*CI based on normal approximation*

Test

|  |  |
| --- | --- |
| Null hypothesis | H₀: p₁ - p₂ = 0 |
| Alternative hypothesis | H₁: p₁ - p₂ ≠ 0 |

|  |  |  |
| --- | --- | --- |
| Method | Z-Value | P-Value |
| Normal approximation | -4.04 | 0.000 |
| Fisher's exact |  | 0.000 |
|  |  |  |

Here, P-value <0.05, reject H0, select H1.

Hence, proportion of male vs females walking in weekdays is different than weekends.