# Chi-square Exercises

Degrees of freedom refers to **the maximum number of logically independent values, which are values that have the freedom to vary, in the data sample**

## Example 1

A restaurant manager wants to find the relationship between quality of service and the salary of customers waiting to be served.

She organizes the task in the following way:

* A random sample of 195 customers is considered.
* Every customer is asked to rate the service of the restaurant as “excellent,” “good,” and “poor.”

She constructs the following hypothesis:

* Null hypothesis (H0)–The quality of service is not dependent on the salary of customers waiting to be served.
* Alternative hypothesis (H1)–The quality of service is dependent on the salary of customers waiting to be served.

The manager divides the customers into three categories based on their salaries–“low,” “medium,” and “high.” The level of significance (α) is 0.05.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Low | Medium | High |
| Excellent | 19 | 20 | 17 |
| Good | 17 | 9 | 41 |
| Poor | 12 | 28 | 33 |

Calculate Chi-square and make a conclusion based on hypothesis

## Question 1

Suppose your company has 900 pieces of furniture and are distributed over four halls. Calculate Chi-square and make a conclusion on the relationship between the hall and the type of furniture. The level of significance (α) is 0.05

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Observation | Hall A | Hall B | Hall C | Hall D |
| Chairs | 70 | 85 | 89 | 59 |
| Tables | 90 | 77 | 65 | 85 |
| stools | 65 | 70 | 69 | 76 |

## Question 2

In a poll to determine which sport a group of people likes to watch the most, the following data was observed and expected:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Football | Basketball | Baseball | Other |
| Expected | 53 | 49 | 37 | 5 |
| Observed | 49 | 51 | 40 | 4 |

## Question 3

A shop owner claims that an equal number of customers come into his shop each weekday. To test this hypothesis, an independent researcher records the number of customers that come into the shop on a given week and finds the following. Find out if there is sufficient evidence to say that the true distribution of customers is different from the distribution that the shop owner claimed. The level of significance (α) is 0.05

Monday: 150 customers

Tuesday:160 customers

Wednesday: 40 customers

Thursday: 87 customers

Friday: 93 customers