Notation:

- $X^2$: calculated value of the test statistic,
- $\nu$: degrees of freedom,
- $\alpha$: significance level of hypothesis test hence
  $\chi^2_{\nu,1-\alpha}$: value of the $1-\alpha$th quantile of the $\chi^2$ distribution on $\nu$ degrees of freedom.
- $H_0$: Null hypothesis, $H_A$: alternative hypothesis.
- $N$: total number of observations, $O$: observed count, $E$: expected count where, more specifically,
  - $O_{ij}$: observed count in cell specified by row $i$ and column $j$,
  - $O_i$: sum of counts in row $i$, i.e. the marginal row total where $O_i = O_{i1} + O_{i2} + \ldots + O_{ic} = \sum_{j=1}^c O_{ij}$,
  - $O_j$: sum of counts in column $j$, i.e. the marginal column total where $O_j = O_{1j} + O_{2j} + \ldots + O_{cj} = \sum_{i=1}^r O_{ij}$.
- $\pi_{ij}$: probability of observing an individual with characteristics corresponding to row $i$ and column $j$.
  $\pi_i$: marginal probability of observing an individual with characteristics corresponding to row $i$, $\pi_j$: marginal probability of observing an individual with characteristics corresponding to column $j$.
  Estimates of these values are given by $\hat{\pi}_{ij}$, $\hat{\pi}_i$, $\hat{\pi}_j$ respectively.
- $P(A_1 \cap A_2)$: probability that both event $A_1$ and $A_2$ are observed.
- $X^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$: general form of the $\chi^2$ test statistic.