

Chi Square Test of Independence:

Example:

Table 1.d. Male and Female Undergraduate Footwear Preferences: Observed Frequencies with Row and Column Totals

	Sandals	Sneakers	Leather shoes	Boots	Other	Total
Male	6	17	13	9	5	50
Female	13	5	7	16	9	50
Total	19	22	20	25	14	100

Question: Are there any relationship between Sex and Choice of Shoe-type?

Testing procedure:

H₀: These two variables are independent. H₁: not so

Male and Female Undergraduate Footwear Preferences: Observed and Expected Frequencies

	Sandals	Sneakers	Leather shoes	Boots	Other	Total
Male observed	6	17	13	9	5	50
expected	9.5	11	10	12.5	7	
Female observed	13	5	7	16	9	50
expected	9.5	11	10	12.5	7	
Total	19	22	20	25	14	100

Male/Sandals: $((19 \times 50)/100) = 9.5$

Male/Sneakers: $((22 \times 50)/100) = 11...$

Male/Sandals: $((6 - 9.5)^2/9.5) = 1.289$

Male/Sneakers: $((17 - 11)^2/11) = 3.273 ...$

The total chi square value for Table 1 is 14.026.

$df = (r-1)(c-1) = 4$

5% cutoff for chi-square statistics with $df = 4 = 9.49$

So we accept/reject (?) the null hypothesis that Sex and choice of show-type are independent at 5% level. Also a p-value of = suggest that there is very strong/week evidence for/against the null hypothesis of independence.