A SIMPLE METHOD FOR CALCULATING
MEAN SQUARE CONTINGENCY

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If we wish to test for a possible relationship between two variables which are not quantitatively measurable, but each of which has two or more categories, the usual procedure is to make a two-way table, giving the frequencies of all the possible combinations.

Assuming independence between the two variables, a second table is built, making the frequencies of each column proportional to the frequencies in the column of row totals. When this is done, each of the row frequencies is found to be proportional to the row of column totals.

The deviation of the actual frequency for a compartment as found in Table 1 from the expected frequency as found in Table 2, is squared and this square is divided by the expected frequency. These quotients are summed over the entire table, giving us Chi-square.

The calculation of Chi-square can be made much simpler by simplifying the formula.

The probability of the occurrence of two independent events is the product of their separate probabilities. Thus the probability of the joint occurrence of Category 3 of the first classification and Category d of the second classification is the probability of the occurrence Category 3 (which is taken to be the fraction of the total number of cases which fall in Category 3), times the probability of the occurrence of Category d. The expected frequency of the compartment is this product of separate probabilities, multiplied by the total number of cases. If we let f_d be the actual compartment frequency, f_e the expected compartment frequency,