Unit I – Problem 10 – Handout (4): Calculation of Chi Square

1. **Add numbers across columns and rows. Calculate total number in the chart.**

Unobtrusive Male vs. Female			
	Male	**Female**	
Full stop	6	6	=12
Rolling stop	16	15	=31
No stop	4	3	=7
	=26	=24	=50

2. **Calculate expected numbers for each individual cell. Do this by multiplying (row sum) by (column sum) and dividing by (total number).**
   - **For example: using 1st cell in the table (male/full stop):**
     $$\frac{(12 \times 26)}{50} = 6.24$$
   - **2nd cell in the table (female/full stop):**
     $$\frac{(12 \times 24)}{50} = 5.76$$

3. **Now you should have an observed number and expected number for each cell. The observed number is the number already in 1st chart. The expected number is the number found in last step (step 2). Sometimes writing both numbers in the chart can be helpful.**

	Male	**Female**	
Full stop	6 (observed) 6.24 (expected)	6 (observed) 5.76 (expected)	=12
Rolling stop	16 (observed) 16.12 (expected)	15 (observed) 14.88 (expected)	=31
No stop	4 (observed) 3.64 (expected)	3 (observed) 3.36 (expected)	=7
	=26	=24	=50

4. **Now calculate Chi square using the following formula:**
   - **Sum of $\frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$**
   - **Calculate this formula for each cell, one at a time. For example: cell #1 (male/full stop):**
     - ✓ Observed number = 6
     - ✓ Expected number = 6.24

     Plugging this into the formula, you have: $\frac{(6-6.24)^2}{6.24} = 0.0092$

     Continue doing this for the rest of cells and add final numbers for each cell together for the final Chi square number. There are 6 total cells, so at the end you should be adding six numbers together for your final Chi Square number.

5. **Calculate degrees of freedom (df):**
   - **(number of rows – 1) x (number of columns – 1)**
     (3 – 1) x (2 – 1) = 2 x 1 = 2 df (degrees of freedom).

6. **Look up the number in the chart at end of handout. At 0.05 significance level, with 2 df, the number in chart should be 5.99. Therefore, in order to reject the null hypothesis, the final answer to the Chi square must be greater or equal to 5.99. The Chi square final answer was found to be 0.0952. This number is less than 5.99, so you fail to reject the null hypothesis.**