INTRODUCTARY DISCUSSION

The projects in Math 101 require a writing component, and are part of the University program of Writing Across the Curriculum. Your project should be self contained and should meet acceptable standards for the communication of written material in a professional setting.

The following example illustrates the level of communication that is expected, but note that your questions are different, as are the total numbers of responses.

MATH 101 Project 1 - Chi square testing. An informal (unscientific) poll was conducted in the Math 101 class that meets at 1 pm.

The class responded to several questions. In this part of the study we examine the differences of opinions concerning *the fear of clowns* with respect to the respondent's overall Grade Point Average.

Of the approximately 240 students enrolled in the class, 186 elected to respond to the survey.

The null and alternative hypothesis for this test are as follows.
Comment: this is not part of the the writeup - we generally form the null hypothesis as the statement that the observed differences are NOT significant.
Null hypothesis: an individuals response to the question *Are or were you afraid of clowns* is independent of their overall GPA.
Alternate hypothesis: an individuals response to the question *Are or were you afraid of clowns* is related to their overall GPA.

After examination of the data, I constructed the following table of Observed values. In the table the following abreviations are used: Y=yes, N=no X=no response or no opinion, regarding a fear of clowns; and, 1=GPA of 1-1.9, 2=GPA of 2-2.9, 3=GPA of 3-4.

	Y	N	X
1	4	8	1
2	56	48	0
3	27	41	1

This shows a total response rate of 46% Yes, 52.2 % No and 1.1% No Responses (X); thus my proportions should be 0.46 Y's, 0.522 N's and 0.011 X's in each category - 1, 2, and 3. Category 1 consists of 13 students who reported a GPA of 2.0 or less, category 2 consists of 104 students reporting a Gpa of 2.1 to 3.0, and category 3 consists of 69 students reporting a GPA of 3.1 or higher.

I then constructed the following Expected table of values using those proportions.

	Y	N	X
1	6.08	6.78	0.14
2	48.65	54.24	1.12
3	32.27	35.98	0.74

At this point I recall that my α level is 0.01, and compute my degrees of freedom as 4.

My χ^2 statistic is then computed as

$$\begin{aligned}\chi^2 &= \frac{(6.08-4)^2}{6.08} + \frac{(6.78-8)^2}{6.78} + \frac{(0.14-1)^2}{0.14} \\ &+ \frac{(48.65-56)^2}{48.65} + \frac{(54.24-48)^2}{54.24} + \frac{(1.12-0)^2}{1.12} \\ &+ \frac{(32.27-27)^2}{32.27} + \frac{(35.98-41)^2}{35.98} + \frac{(0.74-01)^2}{0.74} \\ &= 10.81\end{aligned}$$

In the χ^2 table the entry corresponding to $\alpha = 0.01$ and $d = 4$ is 13.277. Since this entry is LARGER than my computed χ^2 statistic of 10.81, I do not reject my null hypothesis and conclude that a student's answer to the question is independent of their GPA.