Inference for Two-way Tables

Name _____

Class _____

Problem 1 – Party Affiliation

The Quinnipiac University Polling Institute polled New York State residents on April 7, 2009. The results for the following question are given in the table below:

Do you approve or disapprove of the way Barack Obama is handling the economy?

Using a 0.05 significance level, test the claim that the approval rating of the President is independent of a person's political party affiliation.

1. What is the null hypothesis? Alternative hypothesis?

Enter the data without the totals into lists L1, L2, and L3.

	Republicans (L1)	Democrats (L2)	Independents (L3)	Total
Approve	158	886	79	1123
Disapprove	217	39	43	299
Don't Know	47	39	17	103
Total	422	964	139	1525

2. Calculate the expected frequencies for the table using the formula: $\dfrac{\text{(row total)(column total)}}{\text{(grand total)}}$.

Fill in the table below with the expected frequencies. Enter the data into the lists.

	Republicans (L4)	Democrats (L5)	Independents (L6)
Approve			
Disapprove			
Don't Know			

3. To determine the value of each cell use the formula $\dfrac{(\text{observed} - \text{expected})^2}{\text{expected}}$. Substitute the list name for *observed* and *expected*. Then on the Home screen, sum all of the cells together to calculate the test statistic.

Republicans (L7)	Democrats (L8)	Independents (L9)

What is the test statistic for the poll?

4. The degree of freedom equals (# rows – 1)(# columns – 1). What is the degree of freedom for this test?

5. Determine the critical value using a Chi-square distribution chart or the **INVERSX2** program.

6. A value of the test statistic that is larger than the critical value means that the null hypothesis should be rejected. Should you reject or fail to reject the null hypothesis?

7. In the context of the claim, summarize your results below with a sentence or two.

Use the χ^2–**Test** command to test the original claim. First store the data in the table as a 3 × 3 matrix. Enter the observed values, without the "Total" row and column.

```
MATRIX[A]  3 ×3
[ 0      0      0   ]
[ 0      0      0   ]
[ 0      0      0   ]
```

Once the data is entered into the matrix you can use the χ^2–**Test**.

```
X²-Test
 Observed:[A]
 Expected:[B]
 Calculate Draw
```

8. What does the *P*-value indicate?

Problem 2 (Homework) – Gender

Consider the same question as before about the President's approval rating, but this time compare male vs. female. Using a 0.01 significance level, test the claim that the approval rating of the President is independent of a person's gender. Use the data given below.

	Men	Women
Approve	463	563
Disapprove	199	180
Don't know	50	73

1. Based on the data alone, do you think that the two variables are independent or dependent?

2. Using the method requested by your teacher, test the claim given above using a 0.01 significance level. Justify your answer using statistics and write your conclusion. Use either the list method or the χ^2**–Test** command.