1 Hypothesis Testing

1.1 Concepts

1. To test for independence, it is just a modified version of the χ^2 test. You sum up the rows to get N_i and the columns to get M_j. Let the total sum of all the elements be S. Then, your expected distribution at square ij is $\frac{N_i M_j}{S}$, and then you perform the χ^2 test. If you have r rows and c columns, then the number of degrees of freedom is $(r-1)(c-1)$.

1.2 Examples

2. An infomercial claims that a miracle drug will cause you to grow all your hair back. There are 25 brave participants and surprisingly 7 people regrew their hair. If normally 10% of people regrow their hair, can you say that this drug worked?

3. The following are the actual exit poll results from the 2016 election. Is who you vote for and your age independent?

	18-24	25-29	30-39	40-49	50-64	≥ 65
Clinton	1375	1194	2129	2146	3242	1768
Trump	835	840	1628	2286	3831	2043
Other	246	177	418	233	295	118

1.3 Problems

4. Every year 25% of people contract the flu. This year, the NIH comes out with a vaccine and out of 100 people, there are only 20 people who contract the disease. Was the vaccine successful?

5. In a skittle bag, you get 11 red skittles, 12 blue, 5 green, 10 yellow, and 13 orange skittles. Is it possible that the colors are evenly distributed with a significance level of $\alpha = 0.05$?

6. You are wondering whether performing well in this course and gender are related and you get the following table. Are they related?

	Male	Female
Pass	175	725
Fail	25	75

1.4 Extra Problems

7. Every year 25% of people contract the flu. This year, the NIH comes out with a vaccine and out of 1600 people, there are only 350 people who contract the disease. Was the vaccine successful?

8. In a skittle bag, you get 14 red skittles, 12 blue, 1 green, 10 yellow, and 13 orange skittles. Is it possible that the colors are evenly distributed with a significance level of $\alpha = 0.05$?

9. You are wondering whether performing well in this course and gender are related and you get the following table. Are they related?

	Male	Female
Pass	315	485
Fail	85	115