Comparing Two Proportions

Dreaming in Black and White
A study was conducted to determine the proportion of people who dream in black and white instead of color. Among 306 people over the age of 55, 68 dream in black and white, and among 298 people under the age of 25, 13 dream in black and white. We want to use a a 0.01 significance level to test the claim that the proportion of people over 55 who dream in black and white is greater than the proportion of those under 25.

Group 1: People over 55
Group 2: People under 25

Write down information you will need:

\[ n_1 = 306 \quad x_1 = 68 \quad \alpha = 0.01 \]
\[ n_2 = 298 \quad x_2 = 13 \]

We are testing that people over 55 dream in black and white more that people under 25, or Group 1 > Group 2.

\[ H_0 = p_1 \leq p_2 \]
\[ H_A = p_1 > p_2 \]

Now we have what we need to use our calculator.

Calculating Critical Value

Push 2ND, then VARS. Select \texttt{invNorm} and hit ENTER.
Next, we need to input three numbers into this function. First is the area from the left leading up to our rejection region (0.99), and then 0 and 1. Then hit ENTER. The number below is our critical value.

Calculating Test Statistic and P Value

Push STAT, then select TESTS in the upper right hand corner. Select 2-PropZTest... and hit ENTER.

Next, add in the data for both groups and choose our alternative hypothesis ($H_A = \mu_1 > \mu_2$). Now select Calculate and hit ENTER. The $z =$ is our test statistic and the $p =$ is our p value.
Calculating a Confidence Interval

There is one more piece of information we need before calculating a Confidence Interval: What level of confidence should we use?

Please use the following table for choosing your confidence level. We have a one-tailed test and $\alpha = 0.01$, so we will use a confidence level of 98%.

<table>
<thead>
<tr>
<th>Significance Level for Hypothesis Test</th>
<th>Two-Tailed Test</th>
<th>One-Tailed Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>99%</td>
<td>98%</td>
</tr>
<tr>
<td>0.05</td>
<td>95%</td>
<td>90%</td>
</tr>
<tr>
<td>0.10</td>
<td>90%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Push STAT, then select TESTS in the upper right hand corner. Select 2-PropZInt... and hit ENTER.

Next, add in the data for both groups and choose our confidence level (98%). Now select Calculate and hit ENTER. The top numbers in parentheses is our confidence interval.